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II

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FAHMY (I.). **The European Corn Borer, *Pyrausta nubilalis* (Hübn.) a major Pest of Maize in Egypt (Microlepidoptera-Pyralidae).**—*Bull. Soc. R. ent. Égypte* **20** pp. 58–60, 4 refs. Cairo, 1936.

In the course of investigations begun in 1933, *Pyrausta nubilalis*, Hb. [*cf. R.A.E.*, A **22** 101, 575] was found to be generally distributed in maize all over Lower Egypt and in the northern part of Upper Egypt. In the coastal areas around Alexandria and Damietta, infestations of over 50 per cent. were not uncommon, and some of 100 per cent. were found. In these, there were 7–24 borers per infested plant. It is thought that the extensive damage had passed unnoticed because it was confused with that caused by *Sesamia* and *Chilo*, which in several instances were found feeding in the same stalk. There were four generations of *P. nubilalis* each year in the field, the adults emerging in early May, late June, early August and early September. The larvae went into hibernation in October. That four generations occur in Egypt accords with a theory published by C. A. Clark in a paper already noticed [**23** 247] that the number of generations of *P. nubilalis* is correlated with the number of months having a normal mean temperature of 60°F. or over, and that the mean temperature in March serves as an index for it. He concludes that 7 months with temperatures of 60° or over (or a March temperature of 52°) is correlated with three generations and a partial fourth ; in Egypt there are 8·7 months with the requisite warmth and the March temperature averages 58°.

PAGE (A. B. P.) & SHAFIK (M.). **Control of Mites on Insect-stocks and on Fungus Cultures by means of Fumigation.**—*Bull. Soc. R. ent. Égypte* **20** pp. 110–143. Cairo, 1936.

Experiments were carried out in England in 1930–31 on the possibility of saving large numbers of stocks of insect pests of stored products that were being reared for experiment and were infested by mites. Mites from the infested food were identified as *Tyroglyphus dimidiatus*, Herm. (*longior*, Gerv.), *T.* (*Aleurobius*) *farinae*, DeG., *Glycyphagus cadaverum*, Schr., *Hypoaspis* sp., and *Cheyletus eruditus*, Schr. The last two are predacious on insects, and *Hypoaspis* proved to be one of the most resistant to the fumigants tested, the lethal dose being about three times as high for it as for some less resistant mites. Fumigants only slightly toxic to insects were tried in the hope that, at the fairly high dosage permissible, the mites might be killed. The results given refer to resistant mites. Nearly all the present stocks, mostly free from mites, have been bred from infested stock after fumigation. The success obtained led to further experiments, also successful, on the control of mites on fungus cultures. Preliminary experiments were made at room temperature (17–24°C. [62·6–75·2°F.]) and later ones at constant temperature and humidity. Of the 7 substances tested, sulphur [*cf. R.A.E.*, A **17** 184] left the mites apparently unaffected, and acetylene, even at high concentrations, was harmless to the mites, but killed 100 per cent. of adults of *Ephestia kuehniella*, Zell.

At room temperature, the lowest concentrations of ammonia (0·006 per cent. by volume) and pyridine (0·005 per cent.) necessary to kill all the mites in a 4-hour exposure also killed all the larvae of *Plodia interpunctella*, Hb., though in the case of pyridine, 50 per cent. of the larvae, which were left to feed on the fumigated fruit, died 4–15 days

afterwards. All controls survived. No smell of ammonia could be detected on opening a jar half full of sultanas fumigated with 0·02 per cent. 0·880 ammonia solution for 24 hours. Sultanas exposed to 0·005 per cent. pyridine for 4 hours had a strong odour after being aired for 24 hours and a weak odour after 48 hours.

Trichlorethylene at 0·0175 per cent. killed all mites in 4 hours, and at 0·0225 per cent. it killed all eggs of mites, chiefly Tyroglyphids, on a small quantity of barley, in 24 hours. When it was tested at the latter concentration on *Sitotroga cerealella*, Ol., on mite-infested barley, 30 per cent. of the eggs of the moth subsequently hatched, 12 larvae and 13 pupae were found, all apparently unaffected, moths emerged from two of the pupae, and all adults and mites were dead. All first-instar larvae of *Sitotroga*, not protected by being inside grains, were killed by exposure for 4 hours to concentrations of 0·015, 0·0175 and 0·02 per cent. At concentrations between 0·015 and 0·0225 per cent., 2–4 out of 10 larvae of *Tribolium castaneum*, Hbst., were alive after 4 days, and 17 adults of *Calandra* (*Sitophilus*) *granaria*, L., out of 20, survived exposure for 4 hours to 0·0175 per cent.

No mites were apparently alive 1 or 7 days after being exposed for 4 hours to concentrations of 0·025–0·05 per cent. of carbon tetrachloride, but concentrations as low as 0·025 killed all adults of *T. castaneum*, though 1–3 larvae out of 10 survived concentrations of 0·0325–0·045 per cent. Carbon tetrachloride and trichlorethylene both proved fatal to all stages of *Ephestia kuehniella* at the lowest concentration fatal to mites.

At a constant temperature of 25°C. [77°F.] and a constant relative humidity of 80 per cent., with over 100 mites in each experiment, all were killed by exposure for 24 hours to 0·005 per cent. trichlorethylene or 0·01 per cent. carbon tetrachloride and to all concentrations tried, of which the lowest was 0·00025 per cent., of methyl salicylate. Results are quoted of experiments already noticed [**22** 544]. Tables show the effect of different concentrations of trichlorethylene, carbon tetrachloride and methyl salicylate on various stages of 13 species of insects, and the results of tests in which three fumigants proved satisfactory for treatment of various fungus cultures infested by mites.

KAMAL (M.). **Recent Advances in the Control of the Pink Boll-worm (*Platyedra gossypiella*, Saunders) by natural Enemies.**—*Bull. Soc. R. ent. Égypte* **20** pp. 259–293, 10 pls., 2 fldg charts, 2 refs. Cairo, 1936.

An account is given of investigations now being carried out on the biological control of *Platyedra gossypiella*, Saund. (pink boll-worm) on cotton in Egypt [*cf. R.A.E.*, A **17** 503], where it does damage to the value of £6,000,000 annually. It was calculated that in an acre of cotton, there were 114,000 larvae at the beginning of August, 406,000 during September, 1,216,000 in October and 76,000 in November. Biological control is complicated by the fact that the population of *P. gossypiella* almost dies out from December to June, the few remaining larvae are concealed within the bolls, and natural mortality and percentage of attack by *Pediculoides ventricosus*, Newp., is very high among them. The parasites thus die off for lack of host material ; moreover, larvae that have remained in the bolls for a considerable period do not stimulate oviposition as fresh ones do. At present, the highest percentage of parasitism is obtained from November

to February when the host population is already declining. The building up of a natural population of parasites would necessitate the abolition of the close season for cotton so as to ensure the presence of host material throughout the year. Experiments in 4 consecutive years proved this to be quite unjustified.

The possibility of intensifying the activity of indigenous parasites, chiefly *Pimpla roborator*, F., and *Microbracon brevicornis*, Wesm., by breeding was examined in 3 successive years, but no permanent adjustment between host and parasite was obtained, although the kill of the host was increased by bringing the parasites into the field early. *Elasmus platyedrae*, Ferrière [**24** 188], *Habrocytus* sp., *Dibrachys* sp. and *Pleurotropis* sp. are active and are particularly beneficial in the spring and early summer, when *Pimpla* is already in aestivation. Most of the other parasites known to be present in large numbers are probably parasites of *Earias insulana*, Boisd.

Parasites were also imported, and *Microbracon kirkpatricki*, Wlkn., from Kenya [*cf.* **16** 49 ; **17** 541] is being bred continuously for release early in the year. In the laboratory and in its natural habitat, it breeds throughout the year and reproduces much more rapidly than its host, but in Egypt, the definite resting stage of the host interrupts its development, so that, although it has proved capable of destroying the larvae in sound or perforated bolls, attempts made during 5 years to establish it have not given satisfactory results. In an area where over 50,000 have been released every year, the numerical ratio of host and parasite does not seem to have been affected. Possibly adverse weather conditions, particularly the cold winters and nights, as well as the resting stage of the host, are interfering with the permanent establishment of the parasite. *M. mellitor*, Say, was recently introduced from Hawaii. It breeds readily and may become established, as it also parasitises Lepidopterous larvae other than *Platyedra gossypiella*. *Microbracon lefroyi*, D. & G., has been introduced from the Punjab (where it is a common parasite of *E. insulana*) and has been found to attack *P. gossypiella*. For two successive years, liberations of *Trichogramma evanescens*, Westw., which parasitises *Chilo simplex*, Btlr., and *E. insulana* in Egypt, and of *T. minutum*, Riley, which was specially introduced, were begun in June, increased in July and continued until the middle of September. Parasitism depends on the abundance of easily accessible eggs of *P. gossypiella* and the power of dispersal of *Trichogramma*, which is very limited.

So far, no definite reduction in field attack by *P. gossypiella* has been effected by direct liberation of parasites or by the use of natural enemies against the overwintering larvae, but experiments are being continued with parasites introduced from regions such as the Punjab where *P. gossypiella* is indigenous but does not cause significant injury.

HECHT (O.). **Studies on the Biology of** *Chilocorus bipustulatus* (**Coleoptera-Coccinellidae**) **an Enemy of the Red Scale** *Chrysomphalus aurantii*.—*Bull. Soc. R. ent. Égypte* **20** pp. 299–326, 2 figs., 2 graphs, 1 fldg table, 4 refs. Cairo, 1936.

Chilocorus bipustulatus, L., is often observed preying on *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., on *Citrus* in Palestine, though it does not control it. Experiments have been carried out since 1933 to determine whether large numbers of the Coccinellid could be bred for use in biological control. The larvae and adults were fed on pieces

of leaf infested with *Aspidiotus hederae*, Vall., and occasionally on *Citrus* leaves infested with *Aonidiella aurantii*. The latter, however, rarely covers the leaves so densely as does *Aspidiotus* and is therefore less suitable.

Eggs were laid on leaves near or under the scale of *Aspidiotus*. None was found under that of *Aonidiella*, which is pressed too closely to the leaf. Adults of the hibernating generation laid a moderate number of eggs in autumn and then entered a winter pause in oviposition. A few eggs were laid in late autumn and even December. The resumption of general oviposition dated from the beginning of March and reached its peak in March and April. Oviposition lasts over many weeks, sometimes extending to June. Overwintered adults laid 7–122 eggs, with an average of 57·7. Experiment showed that the winter rest in reproduction is not a fixed character, but an effect of low temperatures. More eggs were laid in February–April by females protected from hot, dry desert winds. Except in certain special experiments, the numbers of eggs laid by females of the first and second generations averaged only 16·5 (in May–June) and 2·3 (in July–August), respectively. Later individuals of the second generation showed a higher average. Most adults of these two generations lived only a few weeks, but adults of the overwintered generation had laid large numbers of eggs in a corresponding time. Various observations on beetles kept under different conditions indicated that slight productivity is a fixed character of the first and still more the second generation. Only 9 adults of the third generation were reared and these yielded a single egg on 11th November, but 17 females collected in early September averaged 15·2 eggs each in September and October, 4 that emerged in September from larvae collected in the field averaged 43·2 for October and November, and 6 collected in October averaged 24·7 for October and November before the winter pause. Females presumed to be of a fourth generation laid averages of 8 eggs in October–December. The period of low reproduction coincides with the mass increase of *Aonidiella* [*R.A.E.*, A **22** 554].

Details of the duration of the immature stages are given in tables. The total period from oviposition to adult emergence varied with the season from 30 to 120 days, the egg, larval and pupal stages lasting 7–28 days, 15–81 days and 4–31 days, respectively. The percentage mortality of the eggs varied from about 30 to 50 per cent., but exhibited no marked fluctuations attributable to the season. Mortality of larvae was extremely high from June to August, but thermostat experiments proved that high temperature was not the direct cause. Mortality of pupae was very low.

Mortality of adults collected in autumn was low in winter, high during the last few days of April and early May, probably on account of the desert winds, and low in the course of May, but most of the remaining adults died in June and the rest in July. Most of the first-generation adults died within two months, and adult life of the second generation was also rather short. It is probable that most of the hibernating individuals in Palestine belong to the third and fourth generations, with a few of the second and a possible fifth. The preoviposition period lasted 3–51 days in the summer generations. Some individuals collected in the autumn of 1934 laid no eggs for 130 days. In experiments in which known numbers of *Aspidiotus hederae* (which, unlike *Aonidiella*, can be lifted out of its scale) were given to *Chilocorus*, the average number consumed each day was 2–6·5

by medium-sized and older larvae and 2–18·7 by adults, and was highest in hot weather and in the case of egg-laying females. It seems clear that the available food-supply has a bearing on the reproduction rate of *Chilocorus* and that *Aonidiella aurantii* is frequently not sufficiently abundant in Palestine to assure that this rate reaches its maximum. In a field experiment in July 1935, on lime trees 4 years old and heavily infested by *A. aurantii*, 3 trees were enclosed in wire-screen cages and 2 were left without screens for observation. Into two of the cages, 40 and 4 adults of *Chilocorus* were introduced. In October, all three caged trees were much more severely infested by *A. aurantii* than the two uncaged ones. The infestation of the tree on which 40 beetles had been placed was less heavy than that on the other two caged trees, but was, nevertheless, economically severe. It is thought that the heavy infestations may have been due to the dense growth of the trees, which had had to be severely pruned to allow the cages to be put over them, and the consequent lack of air currents and high humidity. At the close of the experiment, 10 adults of *Chilocorus*, a few larvae and numerous empty pupal skins were found on the tree that had received 40 adults, and 1 larva and 25 adults on the tree that had received 4.

In October 1934, 8 individuals of the Encyrtid, *Homalotylus flaminius*, Dalm., were found on pupae of *Chilocorus*, and in the winter a fungus of the family Laboulbeniaceae was found on adults. It is doubtful whether the fungus is pathogenic, and neither parasite nor fungus was observed to check the propagation of *Chilocorus*.

DE SOYZA (D. J.). *Nymphaea stellata* (**Water Lily**) **as an economic Crop.**—*Trop. Agriculturist* **87** no. 6 pp. 371–376, 1 pl. Peradeniya, December 1936.

Notes are given on the cultivation of *Nymphaea stellata* as a medicinal and vegetable crop in Ceylon. It is often much injured by the larvae of the Pyralid, *Nymphula crisonalis*, Wlk., which feed on the leaves and flowers, sometimes leaving only the veins of the former. They are semi-aquatic and, instead of spiracles, have numerous thread-like processes along the body that enable them to absorb oxygen from the water. Pupation takes place in a chamber formed by rolling up the edge of the leaf.

HUTSON (J. C.). **The Coffee Berry-borer in Ceylon** (*Stephanoderes hampei* **Ferr.**).—*Trop. Agriculturist* **87** no. 6 pp. 378–383, 7 figs. Peradeniya, December 1936.

A description is given of the damage caused to coffee by *Stephanoderes hampei*, Ferr., which has recently been found to occur in Ceylon [*R.A.E.*, A **24** 764] at elevations varying from sea level to 3,000 ft., with notes on its habits and life-history from laboratory investigations [**25** 221]. For slight infestations, it is recommended that all bored berries on the bushes and all fallen berries should be collected at least once a fortnight by early afternoon before the females leave them, and burnt if possible, or, failing this, put into bags and immersed in boiling water for five minutes, after which they may be buried. The remainder of the crop should be treated with boiling water for three minutes before drying and curing. When infestation is heavy, low-growing bushes should be stripped of all berries and flowers, and tall

ones cut back below the fruit-bearing branches, and all the berries thus removed and all fallen ones should be collected and burnt at once. It is particularly important to clear the ground of fallen berries in areas where they might be carried by flood water.

KING (C. B. R.). **Tea Mite Pests.**—*Tea Quart.* **9** pt. 4 pp. 144–153, 1 ref. Talawakelle, December 1936.

A brief account is given of the bionomics of the four species of mites that attack tea in Ceylon [*R.A.E.*, A **15** 359]; they all cause discolouration of the leaves and leaf fall if infestation is severe.

The larval and nymphal stages of *Tetranychus bioculatus*, W.-M., were completed in about a fortnight at 71–72°F. and there was a pre-oviposition period of 1–2 days. It is probable that a full cycle requires 3 weeks under natural conditions at altitudes of 4,500 ft. or more. The females laid 40–50 eggs. Infestation is associated with dry weather and is seldom of importance in Ceylon. The life-cycle of *Eriophyes carinatus*, Green, was completed in 13 days at 74°F., the egg stage lasting 6 days and the preoviposition period 2. The maximum number of eggs laid by a female was 13. Although this mite may cause defoliation in times of drought, it is seldom an important pest. *Tenuipalpus obovatus*, Donn., is the least numerous of the four species. The egg stage lasted 10–14 days at an average temperature of 75°F., and complete development required 31–36 days at a slightly lower temperature. Parthenogenesis resulted in the production of females, whereas in the other three mites only males were so produced.

Tarsonemus translucens, Green, completed its life-cycle in 7 days at 69°F. In 15 days, several females laid an average of 26 eggs each. This mite is prevalent from January to March and from August to November, particularly in September. It is the most injurious of the four mites, attacking the young leaves, whereas the others prefer the old ones. It is favoured by rainy weather, while good growing conditions enable the plant to become free from infestation.

Very brief descriptions are given of some of the stages of these mites, including the eggs of all except *T. translucens*. In cases of chronic attack, about 50 lb. sulphur dust per acre should be applied to the bushes between pruning and tipping, preferably in dry weather. If it is necessary to dust while the tea is being plucked, two applications, each of 8–10 lb. per acre, should be made, the first immediately after plucking and the second a week later. A fortnight should then elapse before plucking is resumed, to avoid tainting.

VAN DER MEER MOHR (J. C.). **Plagen der tabak.** [Pests of Tobacco.] —*Meded. Deli Proefst.* (2) no. 96 pp. 11–20. Medan, 1937.

Tobacco in Deli, Sumatra, was attacked in 1936 by the usual pests and records are given of their occurrence. Very severe injury was caused by *Plusia signata*, F., and by *Myzus persicae*, Sulz.

KUWAYAMA (S.). **Notes on the Pea Moth,** *Grapholitha nigricana* **Stephens, in Nippon.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 1–11, 3 figs., 19 refs. Tokyo, February 1937.

Cydia (*Grapholitha*) *nigricana*, Steph., is a serious pest of peas in Hokkaido, where it is widely distributed and has one generation a year. The mature larvae hibernate, usually in cocoons in the soil, but

sometimes among or in the harvested pods. The moths emerge in the second half of July or early August and lay their eggs singly on the young pods. The larvae hatch in about 8 days and bore into the pods, where they feed on the seeds and mature in about 3 weeks. Infestation is reduced by sprays of nicotine sulphate or lead arsenate.

KAMITO (A.). **Process of Spread of the serious exotic Pests in Japan.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 29–41, 7 figs. Tokyo, February 1937.

Eriosoma lanigerum, Hsm., was probably introduced into Japan from North America in 1872, though apple trees were imported from Germany in 1867 and from France in 1875. *Phylloxera vitifoliae*, Fitch (*vastatrix*, Planch.), was first observed in 1885 on vines brought from North America in 1882. *Bruchus pisorum*, L., which also came from North America, and *B. rufimanus*, Boh., appeared in 1887 and 1926, respectively. *Icerya purchasi*, Mask., was discovered in 1911 on *Citrus* plants originating from California, but *Prontaspis yanonensis*, Kuw., and *Ceroplastes rubens*, Mask., were found in the Nagasaki Prefecture as long ago as 1885–88. All these insects are now widely distributed in Japan.

ENDO (K.). **Some Problems on Carbon Disulphide and Chloropicrin as Fumigants.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 70–79, 1 fig. Tokyo, February 1937.

It has been found that fumigation with carbon bisulphide at the rate of 12 lb. per 1,000 cu. ft. space for 36 hours does not affect the germination of wheat, even if it contains 28·8 per cent. water. Chlorpicrin at the rate of 1 lb. for 72 hours reduces germination if the wheat contains more than 16 per cent. water, but not if it contains less than 14 per cent. Some larvae of *Sitotroga cerealella*, Ol., and *Bruchus pisorum*, L., survive fumigation with carbon bisulphide at rates of 8–10 lb. and 12 lb., respectively, for 36 hours, but all are killed by using chlorpicrin at rates of 0·8 lb. and 0·75 lb., respectively, for 72 hours. The effectiveness of these fumigants diminishes with the increase of the volume of wheat per 1,000 cu. ft. space.

IYATOMI (K.) & YAMASHITA (S.). **Notes on the Oviposition of** *Trichogramma japonicum* **Ashm.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 146–149. Tokyo, February 1937.

Trichogramma japonicum, Ashm., is a very effective parasite of *Chilo simplex*, Btlr., in Japan. It is now reared in numbers in young eggs of *Ephestia cautella*, Wlk.; older ones are less readily parasitised, and the rate of development and percentage survival of the larvae in them are reduced.

ESAKI (T.). **Insects injurious to Cotton in Mandated South Sea Islands of Japan. First Report.**—[*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 164–169, 2 figs. Tokyo, February 1937.

Very brief notes are given on the insects known to attack cotton in the islands under Japanese mandate in Micronesia. They comprise

Oxycarenus bicolor, Fieb., *Dysdercus cingulatus*, F. (*megalopygus*, Bred.), *D. philippinus*, H.-S., *Aphis gossypii*, Glov., *Saissetia nigra*, Nietn., *Ferrisiana virgata*, Ckll., *Platyedra* (*Gelechia*) *gossypiella*, Saund., and *Earias fabia*, Stoll.

SONAN (J.). **Studies on the Tobacco Caterpillar** (*Prodenia litura* **Fab.**) **in Formosa.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 175–177. Tokyo, February 1937.

The larvae of *Prodenia litura*, F., are known to feed on 45 different plants in Formosa and are sometimes very injurious to vegetables, including sweet potato, and to green manure plants, tobacco, and castor [*Ricinus communis*]. Near Taihoku, all stages can be found at any season, and there are 8 generations a year, the egg, larval and pupal stages lasting 3–12, 11–53 and 6–61 days, respectively. A female lays a total of 400–1,600 eggs in 3–6 masses. Natural enemies include the Ichneumonid, *Metopius kakugawanus*, Mats., the Braconids, *Chelonus formosanus*, Sonan, and *Apanteles ruficrus*, Hal., entomogenous fungi, and the predators, *Cantheconidea furcellata*, Wolff, and *Callida splendidula*, F.

SHINJI (O.). **On one Species of Phylloxeridae and Chermesidae unrecorded from Japan.** [*In Japanese.*]—*Kontyû* **11** no. 1–2 pp. 178–179. Tokyo, February 1937.

Brief descriptions are given of *Phylloxera salicis*, Licht., found on willow, and *Chermes cembrae*, Cholod. (*Pineus sibiricus*, Cholod.), on pine.

SCHÜTZE (K. T.). **Blattlausfeinde.** [Aphid Enemies.]—*Isis Budissina* **13** (1932–35) pp. 138–141. Bautzen, 1936.

Natural enemies of Aphids observed near Bautzen, Germany, included the Tortricid, *Phtheochroa schreibersiana*, Froel., in the leaf-galls of *Colopha compressa*, Koch, on elm; *Leucopis griseola*, Fall., attacking *Prociphilus nidificus*, Lw., on ash; and the Hemerobiid *Drepanepteryx phalaenoides*, L., and the Reduviid, *Empicoris* (*Ploiariola*) *culiciformis*, DeG., both predacious on *Byrsocrypta gallarum*, Gmel. (*Tetraneura ulmi*, DeG.) on elm.

W[IESMANN] (R.). **Starkes Auftreten zweier Obstbaumschädlinge.** [A dense Occurrence of two Fruit-tree Pests.]—*Schweiz. Z. Obst- u. Weinbau* **45** pp. 212–214, 1936. (Abstr. in *Neuheiten PflSch.* **30** no. 1 pp. 17–18. Vienna, February 1937.)

Contarinia pyrivora, Riley, infested up to 100 per cent. of the perry pears in orchards near Wädenswil, Switzerland, in 1936. If the infestation spreads to table pears, so that measures for control become necessary, the soil under the trees should be treated with 8 per cent. tar distillate, at the rate of about $\frac{1}{2}$ gal. per tree, to destroy the pupae in early spring.

Anthonomus rectirostris, L. (*druparum*, L.) attacked wild cherry near Uetikon so severely that some fruits had more than 10 punctures. As it can develop undisturbed in the fruits lying on the ground, wild cherry is a serious source of infestation for edible cherries.

Baranyovics (F.). **Ein neuer Erdbeer-Schädling.** [A new Strawberry Pest.]—*Növényvédelem* **12** p. 113, 1936. (Abstr. in *Neuheiten PflSch.* **30** no. 1 pp. 23–24. Vienna, February 1937).

A local outbreak of *Rhynchites germanicus*, Hbst., occurred on strawberry in Hungary in 1936. The adults appeared when the plants were blossoming and oviposited in the stalks of the flowers or buds, which they then severed. The eggs hatched in a few days. In one field 80 per cent. of the stalks were infested. Dusting with pyrethrum in the warm forenoon hours proved effective in control.

Jary (S. G.) & Austin (M. D.). **Department of Entomology** [Report 1935–36].—*J. S.-E. agric. Coll.* no. 39 pp. 9–15, 4 refs. Wye, Kent, January 1937.

Brief notes are given on the more important pests observed in south-eastern England during the year ending on 30th September 1936. Infestation of cereals by *Oscinella frit*, L., was more common than for some years, and was especially heavy on "huskless" oats, which, being sown in late March or early April, were particularly liable to attack. Some injury was caused to barley by *Chlorops taeniopus*, Mg., and to various cereals by *Agriotes* spp. and *Tipula* spp. The Capsid, *Calocoris norvegicus*, Gmel., was abnormally abundant on potato foliage in July, but caused little damage apart from marking the leaves. Leguminous crops were attacked by *Sitona lineata*, L., which in some localities almost defoliated seedlings; later in the season infestation by *Kakothrips pisivorus*, Westw., was severe and many field crops were ruined. *Agriotes* spp. almost completely destroyed two successive sowings of sugar-beet in experimental plots where it followed a three year ley, but potatoes in the same field were unharmed. The larvae of various Lamellicorns, particularly *Anomala* (*Phyllopertha*) *horticola*, L., continued to cause considerable damage to grassland. Injury to crucifers by flea-beetles, particularly *Phyllotreta atra*, F., and *P. consobrina*, Curt., was evident in the spring, but although many seedlings were lost, infestation decreased in early summer. Some damage was also done by *Phorbia* (*Chortophila*) *brassicae*, Bch., and by *Plutella maculipennis*, Curt., which is believed to be largely a migrant from the Continent and appeared in large numbers in one locality on 21st–22nd June when warm weather and a light south-easterly wind succeeded a period unfavourable for migration. Serious injury to lettuce was caused locally by *Psila nigricornis*, Mg. Other vegetable pests more than usually abundant were *P. rosae*, F., and *Anuraphis tulipae*, Boy., on carrots, *Acidia heraclei*, L., on celery and parsnip, and *Crioceris asparagi*, L., on asparagus.

Injury to apple by *Cydia pomonella*, L., was severe in only a very few localities, but the pith moth, *Chrysoclista* (*Blastodacna*) sp., was reported more frequently, various Tortricids caused marking on the fruits in the late summer, and many larvae of *Zeuzera pyrina*, L. (*aesculi*, L.) were found boring into young trees. Winter washes of petroleum oil failed to control *Plesiocoris rugicollis*, Fall., on the

Monarch variety of apple, although they were effective on adjacent varieties. *Aphelinus mali*, Hald., was liberated in two localities against *Eriosoma lanigerum*, Hsm., and appears to have become established in both. Other pests of apple included *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.), *Rhynchites aequatus*, L., and *Xyleborus dispar*, F., and some damage to newly-planted trees and grafts was caused by *Phyllobius pyri*, L., and *Otiorrhynchus singularis*, L. The application of derris washes to plums against *Hoplocampa flava*, L., gave adequate control in most orchards, but in one, where the treatment was given just after the optimum time, very poor results were obtained. The intensity of attack on black currants by *Eriophyes ribis*, Nal., seems to have increased during the last few years, and heavy infestations were reported from some places. In one instance Cecidomyiid larvae were found in the galled buds, but they were apparently parasitised by the Eulophid, *Tetrastichus inunctus*, Nees, which was also bred freely from such buds. Experiments on the strength of lime-sulphur required to control the mite were initiated, as the strength now recommended (1 : 12) injures the foliage of most bushes. Work in the laboratory shows that, if direct contact with the mites is obtained, a concentration as low as 1 : 10,000 is effective ; but, as they migrate, control cannot be appreciably due to immediate contact action. Mites were killed when crawling over bud scales and wood coated with the deposit some days after it had been applied. Strawberries in many localities were damaged by Carabids, and late in 1935 *Capitophorus potentillae*, Wlk. (*fragariae*, Theo.) was plentiful. In one district, where injury by *Anthonomus rubi*, Hbst., is often severe, attacks were somewhat below normal, which may possibly be correlated with the fact that parasites were bred from almost 50 per cent. of the buds attacked in 1935 [*cf. R.A.E.*, A **24** 225]. In field experiments on its control, 10 applications of derris dust (0·5 per cent. rotenone), each at the rate of 11 lb. per acre, did not reduce the number of buds attacked, and no weevils were killed by a spray containing sodium arsenite and glycerine applied along the hedgerows and paths across which they were found to migrate to the strawberries.

Pests of hops included *Contarinia* (*Diplosis*) *humuli*, Tölg, *Euacanthus interruptus*, L., and *Phorodon humuli*, Schr., which occurred throughout the summer and against which many applications of nicotine wash were necessary. The larvae of various Phorids, and to a less degree Sciarids, have caused injury to mushrooms grown at temperatures above 65°F. *Sciara varians*, Joh., was taken in mushroom houses, but is not known to infest mushrooms. In preliminary spraying trials, pyrethrum extracts atomised in small quantities reduced the numbers of Phorid and Sciarid flies in mushroom houses and seemed superior to the nicotine sprays previously used. Mushrooms were also heavily infested by the millepede, *Cylindroiulus britannicus*, Verhoeff, and some, when nearly mature, were damaged by the mite, *Linopodes motatorius*, L. (*antennaepes*, Banks). In addition to the common mushroom springtail (*Hypogastrura armata*, Nic.), *H. manubrialis*, Tullbg., was found on mushrooms from Mid-Lothian, and another species, *Xenylla mucronata*, Ax., occurred commonly on one sample and was apparently injurious. Pests of garden flowers included *Emphytus pallipes*, Spin., and the mite, *Eriophyes violae*, Nal., both of which attacked the foliage of viola. Some injury to pines was caused by *Diprion* (*Lophyrus*) *pini*, L.

Sevastopulo (D. G.). *Chrysis shanghaiensis* **Smith, a Parasite of** *Parasa lepida* **Cr.**—*Proc. R. ent. Soc. Lond.* (A) **12** pt. 1–2 p. 11, 1 ref. London, 15th February 1937.

In July 1936 [? in India], the author observed adults of *Chrysis shanghaiensis*, Smith [*cf. R.A.E.*, A **24** 561] nibbling at cocoons of *Parasa lepida*, Cram., on the trunk of a mango tree. Later he found that a number of the cocoons had been parasitised by this Chrysid, which pupated in them. The adults emerged rather later than the moths from unparasitised cocoons, but several had appeared by 6th September.

Austin (M. D.). **Notes on the Status of Flies of the Family Sphaeroceridae (Borboridae) in the Economy of cultivated Mushrooms.**—*Proc. R. ent. Soc. Lond.* (A) **12** pt. 1–2 pp. 15–16, 8 refs. London, 15th February 1937.

Borborid flies have sometimes been found associated with mushroom beds in England [*cf. R.A.E.*, A **21** 397] and, more frequently, with stable manure before its use as mushroom compost, but they have not been known to damage mushrooms. In 1936, however, adults of *Leptocera heteroneura*, Hal., emerged in June from cultivated mushrooms heavily infested with Dipterous larvae. The adults oviposited readily on stable manure, both sterile and unsterile, and the larvae were reared according to a technique already described [**24** 263]. It is not certain that this species was the primary cause of damage to the mushrooms, which were also attacked by Phorids, but it must be considered as at least a potential pest.

Staniland (L. N.) & Barber (D. R.). **The Efficiency of Baths used for the Hot-water Treatment of Narcissus Bulbs.**—*Bull. Minist. Agric.* no. 105, 29 pp., 13 figs., 5 refs. London, H.M.S.O., 1937. Price 1*s*.

Although this paper deals with the use of heat treatment for narcissus bulbs infested with Nematodes [*R.A.E.*, A **21** 448], the methods are also applicable for the treatment of strawberries [against *Tarsonemus pallidus*, Banks (*cf.* **22** 581 ; **25** 121, etc.)], chrysanthemums, etc. Hot-water treatments have already given a considerable measure of success, but have sometimes proved inefficient when used on a large scale. The experiments here described in detail show that this is due to failure to obtain and maintain a proper temperature (110°F. for 17 minutes) in all the treated bulbs, the causes including the use of sacks to contain the bulbs, inadequate thermometers, incorrect steam pressures and unsatisfactory types of baths. As a result, recommendations are given for more adequate treatments. The thermometer must be accurate, or, if not, the extent of its inaccuracy should be allowed for, and it should be checked at the opening of each treating season. It should act quickly, whereas the very large thermometers usually supplied act slowly. Small floating thermometers may be used, or a small thermometer inserted horizontally through the side of the bath by means of a packing gland and suitably guarded, but the best results are obtained with thermometers actually within the bulb containers. Long ones could be used in such a situation, but would act slowly, and experiments have indicated that a bi-metallic thermometer may be the most suitable. This acts quickly, costs less than the large types in general use, has a long stem, and records the

temperature by means of a pointer moving over a circular, graduated scale, which is particularly suited to use by inexperienced labour.

The best results have been obtained with circular baths. These do not require artificial circulation of the water when rigid containers are used. Square or rectangular baths must always be provided with artificial circulation, and even then they do not give such uniform treatment as the circular ones. Baths of all types should be insulated with asbestos cement, felt or other suitable material, as otherwise bulbs near the walls will be underheated. The ratio of the volume of water to the volume of bulbs being treated must be as high as possible. Where 10 cwt. of bulbs in sacks are treated in a 10-cwt. bath, this ratio is approximately 1 : $1\frac{1}{2}$, but, by using rigid containers, holding in all 8 cwt. of bulbs in the same tank, this ratio is increased to 1 : 1, so that over a third more water is available to allow of better circulation and to promote even heating.

Electric heating of the baths is the most efficient, but is uneconomical except for very small ones. Oil burners concentrate the heat within a small area at the base, which leads to localised overheating of the bulbs. Spreaders for the heat should vary according to the type of burner, and in addition a piston-type agitator should be fitted to ensure even circulation. Gas heating can be satisfactorily arranged. Steam may be passed through a closed coil in the bottom of the bath, but the pressure should not exceed 10 lb. per square inch. With high-pressure steam, up to 40 lb. per square inch, the bath may be rapidly pre-heated, but it is then essential that a reducing valve should be fitted in the supply pipe to the closed coil for temperature control. The high pressure steam is introduced, as live steam, through a separate pipe directly into the water during pre-heating before the loading of the bulbs.

Rigid containers should be used instead of sacks, as in the latter the treatment cannot be relied upon to give complete control of Nematodes. The most suitable form tested was a crate of wooden battens lined with wire netting. All-metal containers should be made in a wire mesh, and if sheet metal is used, the holes should be square and not round (to prevent blocking by the bulbs). The form of the containers should preferably be such that the bath can be loaded in several tiers. Less water is lost from the baths with containers than with sacks ; the containers can be subdivided more readily for the treatment of small stocks of different varieties, and in them the bulbs cool more rapidly. The inclusion of any small sacks or similar packages inside a container vitiates the results obtained, but very small lots of bulbs may be kept separate from others by tying them in a single thickness of $\frac{1}{2}$-inch mesh fish netting. A false bottom, that can be raised by means of a chain and tackle, can be fitted to the baths so as to facilitate the placing and removing of containers.

Experiments showed that an initial temperature of approximately 115°F. is suitable before the loading of the bulbs ; such a temperature is not communicated to the centres of the bulbs. In the circular baths tested with rigid containers, which gave the best results, a difference of 0·5°F. was noted between the hottest water, as shown by the thermometer, and the coolest bulb heat recorded. This factor should be allowed for by maintaining the bath at a working temperature of 110·5°F. Absolute agreement between water and internal bulb temperature is only obtainable under laboratory treatment of single bulbs.

Della Beffa (G.). **Contributo alla conoscenza degli insetti parassiti dei pioppi. L'*Earias vernana* Hb. (Nottua delle gemme del pioppo bianco.)** [A Contribution to the Knowledge of Insect Parasites of Poplars. *Earias vernana*, the Noctuid of the Buds of White Poplar.]—*Boll. Lab. sper. Oss. Fitopat. Torino* **13** no. 5–6 pp. 53–58, 2 pls., 19 refs. Turin, 1936.

Descriptions are given of the adult, larva and pupa of *Earias vernana*, Hb., which occurs only on white poplar (*Populus alba*) and has two generations a year in Piedmont. The adults emerge from the overwintered cocoons in the second half of June, and pair and oviposit after a few days. The eggs are laid on the highest leaf-buds ; only one is laid in each by a given female, but two or three females may oviposit on the same bud. The larva feeds inside the bud and pupates in a cocoon nearby. The adults of the first generation emerge early in August. The second-generation larvae pupate in mid-September ; the cocoons can be found adhering to twigs or fallen leaves during the winter. The chief injury is done to nursery plants, as the infestation of the apical bud retards growth and causes deformation. The larvae can be killed by dipping an infested bud for a few moments into a solution of nicotine and soap, no harm being done to the plant.

Martelli (G. M.). **Il " naso di ferro " dei limoni siciliani.**—*Riv. Pat. veg.* **27** no. 1–2, reprint 12 pp., 4 figs., 2 refs. Pavia, 1937.

In Sicily, *Tetranychus telarius*, L., causes a necrosis of the outer layer of the skin of lemons, which is not harmful except to the appearance of the fruit. In August, the egg stage lasted 4 days in greenhouses at temperatures between 45 and 24°C. [113 and 75·2°F.], and 5 days in the open, the maximum shade temperature being 33°C. [91·4°F.] and the minimum night temperature 16°C. [60·8°F.]. Near Palermo, all stages of the mite are attacked by the larvae and adults of the Coccinellid, *Stethorus punctillum*, Weise. The author has obtained good results in its control with a 1 per cent. oil emulsion.

[Strel'nikov (I. D.).] **Стрельников (И. Д.). Zur Frage über die Wärmeproduktion der Insekten infolge von Bewegungen und Sonnenbestrahlung.** [On the Question of Heat-production of Insects as a Consequence of Movements and Solar Radiation.] [*In Russian.*]—*Bull. Inst. sci. Lesshaft* **19** no. 1 pp. 243–255, 13 refs. (With a Summary in German.) Leningrad, 1935.

Data from the literature and the author's work on changes in the body temperature of insects under the influence of solar radiation [*R.A.E.*, A **21** 160 ; **24** 312 ; **25** 272] and of muscular activity are reviewed ; these suggest that Lepidoptera, Orthoptera and bees generate sufficient heat during flight to make them comparatively independent of the temperature of the air.

The body temperatures during wing movements were measured by a thermoelectric needle inserted into the body and connected with a Zeiss loop galvanometer. In *Locusta migratoria*, L., at an air temperature of 27°C. [80·6°F.], the temperatures of the abdomen and of the thorax rose to 30·5 and 37°C. [86·9 and 98·6°F.], respectively, after wing movements had lasted for 2½ minutes. In the hoppers of

this locust, the difference between the body temperature produced by radiant heat and that generated by jumping activity, as indicated by comparison of the temperatures of the abdomen and thorax, was about 2–3°C. [3·6–5·4°F.], rising with quicker movements to 6·3°C. [11·34°F.], and decreasing to 0·1–1·2°C. [0·18–2·16°F.] with reduced movement during cloudy weather.

Nefedov (N. I.) & Nefedova (N. V.). **A Study on the Quantative Determination of Acrididae Females with ripe Eggs.** [*In Russian.*] —*Bull. Inst. Rech. biol. Perm* **10** no. 8 pp. 271–283, 9 refs. Perm, 1936. (With a Summary in English.)

During field studies on non-swarming Acridids in the Troitzk district in the south of the Ural Province in the summer of 1932, large numbers of dissections were made in order to determine the state of sexual maturation of the females. The percentage of females containing fully developed eggs among the total number of females of a given species to a unit catch (by means of sweeping with a net) was taken to be the index of the egg-laying activity at the time.

The analysis of the figures obtained for a number of species indicates that maximum oviposition for most of them occurs between 15th July and 15th August. In *Chorthippus albomarginatus*, DeG., mature females first appear during the last 10 days of June, and there are 5 periods of maximum egg-laying; in *Pararcyptera microptera*, F. W., they appear between 10th and 20th June and there are 4 such periods.

King (K. M.), Berg (V. L.) & Paul (L. C.). **Summary of Saskatchewan Grasshopper Infestations Autumn 1936 and Ratings of Probable Outbreaks 1937.**—*Saskatoon Leafl. ent. Br. Dep. Agric. Canada* no. 47, 86 pp. multigraph, map, poster. Ottawa, December 1936.

The surveys of egg-infestation in the autumn of 1936 were carried out in the same way as in the previous years [*cf. R.A.E.*, A **23** 311; **24** 444]. They were made along lines at intervals of about 6 miles; and in the case of roadside infestations, egg-counts were made every mile. The data obtained by comparing the averages for the repeated surveys in a given district, supplemented by additional observations to measure the progress of oviposition, were reduced to common terms, *viz.*, the number of viable eggs or unparasitised egg-pods per unit area, and the ratings of probable severity of outbreaks in 1937 were estimated on this basis. The results of the surveys and the ratings are given in tables, and a map shows the probable distribution and severity of outbreaks of grasshoppers, and also of the pale western cutworm [*Porosagrotis orthogonia*, Morr.], in 1937.

The total autumn grasshopper infestation was greater than in 1935, but not as great as in 1932–34. The greatest increase was in northern Saskatchewan, where *Camnula pellucida*, Scudd., which is most abundant on heavy "loose top" soils of high lime content, was the predominant species. *Melanoplus mexicanus mexicanus*, Sauss., which is most abundant on medium and light soils, was predominant in the southern area, while *Melanoplus bivittatus*, Say, was numerous in the Regina district.

Fleming (W. E.), Baker (F. E.) & Koblitsky (L.). **The insecticidal Action of Acid Lead Arsenate on the Larvae of the Japanese Beetle in different Types of Soil.**—*J. agric. Res.* **53** no. 10 pp. 771–779, 18 refs. Washington, D.C., 1937.

As it has frequently been observed in the field that larvae of *Popillia japonica*, Newm., are more readily destroyed by acid lead arsenate in certain types of soil than in others, an investigation was undertaken to determine whether the effectiveness of the insecticide was correlated with any intrinsic property of 15 types of soil selected from different localities in New Jersey. Larvae are killed by ingesting acid lead arsenate while burrowing through poisoned soil or feeding on rootlets growing in the soil. The insecticidal action may be attributed entirely to the arsenate radical, for arsenates of other metals are toxic [*R.A.E.*, A **24** 562], and other lead salts that have recently been tested are not. When the amount of lead arsenate required to give 50 per cent. mortality in a selected soil was taken as the standard, the coefficient of effectiveness for the other 14 soils varied from 0·30 to 2·18.

The following is taken from the authors' summary. It is probable that the variation in toxicity is due to the reaction of the arsenate radical with the colloidal matter or salts in the soil to form arsenates of varying degrees of toxicity. There was an insignificant correlation between the coefficient of effectiveness and the total nitrogen, phosphates, potassium, calcium, magnesium and carbon in the soils, but the water-soluble constituents accounted for 77 per cent. of the variance. The concentrations of water-soluble phosphates, calcium and magnesium appear to be the most important factors. The greater the concentrations of soluble phosphates and calcium in the soil when acid lead arsenate is applied, the more effective it is, and the greater the concentration of soluble magnesium, the less effective it is. The influence of soluble chlorides, manganese, nitrates, ammonium and potassium is of minor importance. Although the hydrogen-ion concentration is a minor factor, the nature of the radicals producing the acidity or alkalinity being more important, it is apparent that acid lead arsenate is generally more effective in acid than in alkaline soils.

Hammer (O. H.). **The Biology of the Apple Curculio** (*Tachypterellus quadrigibbus* **Say**).—*Tech. Bull. N.Y. St. agric. Exp. Sta.* no. 240, 50 pp., 17 figs., 29 refs. Geneva, N.Y., November 1936.

Descriptions are given of all stages of *Tachypterellus quadrigibbus*, Say, which has caused severe damage to apples in the Lake Champlain fruit district of New York since 1930 [*cf. R.A.E.*, A **20** 516]. It is indigenous to the eastern part of the United States and Canada, its native food-plants being hawthorns (*Crataegus* spp.) and crab apples, and has often been confused with *T. quadrigibbus magnus*, List [*cf.* **20** 703], a form with which it apparently intergrades on the western border of its range.

In New York, the adult weevils begin to leave their hibernating quarters and move on to the trees as soon as a ground surface temperature of 60°F. or more has been maintained for about 24 hours. They feign death and drop to the ground when disturbed, and at temperatures approaching 70°F. can thus easily be shaken from the trees on to a sheet and collected, but at higher temperatures they are likely to take flight. The oviposition period extends from late May to about

mid-July. Each egg is deposited in a puncture made in the fruit ; only one is usually deposited in a small apple, but six or more may be laid in a larger one. In the later part of the oviposition period, the smaller fruits are generally selected. After depositing the egg, the weevil seals the cavity with a pellet of excreta. The number of eggs laid by a female in the laboratory varied from 1 to 127, with an average of 28·06. The mortality rate in eggs laid late in the season was higher than in those laid earlier, as in July the rapid growth of the fruit tissue surrounding the oviposition cavities tends to crush the eggs. Only one larva develops in each apple as a rule, but occasionally two are found. Larval mortality is less in apples that drop to the ground in June, but a great many larvae develop normally in those that remain on the trees. Pupation occurs in the larval feeding cavity. The egg, larval and pupal stages have been found to last 4·5–7, 15–23 and 5–9 days, with averages of 6, 19 and 6·5, respectively. Larval development varies according to the size and variety of the infested apple and is slower in growing fruits.

The percentages of the various stages present in fallen fruit in June, and in growing apples from mid-July to mid-September are shown graphically. Far more weevils emerge from the " June drops " than from other fruits. Their emergence begins in mid-July and reaches a peak in about a fortnight. Emergence from thinned fruits occurs somewhat later. From growing fruits, it begins early in August and continues until low temperatures reduce the activity of the weevils. Pupae subjected to growth of the surrounding tissue often give rise to deformed adults, some of which are unable to emerge. Feeding of the newly emerged weevils continues until the fruit is harvested or until hibernation begins. Hibernation occurs under leaves, mulch, and other débris on the ground, the weevils apparently never actually entering the soil. Winter mortality in individuals caged in normal hibernation quarters was 31 per cent. in 1932–33 and 55 per cent. in 1933–34. Observations have indicated that the overwintered weevils migrate from the apples to hawthorn trees when these come into full bloom and back to the orchards later. As the four species of hawthorn in north-eastern New York bloom at different times, there is a considerable amount of cross-migration. Most of the overwintered weevils die in late July or early August.

In studies of the weevil population on a large tree, the maximum number of overwintered adults collected on any one day was 478, and at the end of their feeding period, 98·93 per cent. of the apples were damaged. Of the adults of the new generation, 977 emerged from 3,000 June drops, 478 from 5,218 thinned fruits, and 395 from 5,199 windfalls and picked apples. This was, however, an unusually heavy infestation. Studies with marked weevils indicated that dispersal is slow under normal conditions, but may be accelerated by crop failure in any one orchard. Infestation is most severe in closely planted uncultivated orchards, where the immature stages are sheltered from the heat of the sun and favourable hibernation quarters are available for the adults, and in those protected from strong winds and near woodlands or other sources of infestation. Some varieties of apple are much more susceptible to attack than others, but none is immune. When the weevils first appear on the trees, they attack all the young succulent growth, including the buds and later the blossom, and feed on the fruit as soon as it sets. Feeding punctures may extend in as far as the seed. Most of the commercial injury to apple crops is

done in the spring by feeding and egg punctures made by the overwintered beetles. It is thought that infestation does not cause any appreciable increase in the number of June drops. In late summer, the feeding punctures may act as means of entrance for fungi and other insects, notably *Euphoria inda*, L., and *Glischrochilus fasciatus*, Ol. Some birds and nectar-feeding insects are also attracted to the punctures.

Parasites of *T. quadrigibbus* in the Champlain Valley include *Eurytoma tylodermatis*, Ashm., *Entedon tachypterelli*, Gah., *Habrocytus piercei*, Crwf., *Zatropis incertus*, Ashm., *Microbracon tachypteri*, Mues., *M. mellitor*, Say, and *Triaspis curculionis*, Fitch. Brief notes are given on the bionomics of the first three species ; only one individual of each of the last two was reared. The total yearly percentage of parasitism over a period of 5 years varied from 4 to 25. Larvae, pupae and adults of the weevil are occasionally killed by fungi. When one apple is attacked by a larva of *Cydia* (*Carpocapsa*) *pomonella*, L., or *Conotrachelus nenuphar*, Hbst., as well as by *T. quadrigibbus*, the latter perishes unless the fruit is very large.

Newcomer (E. J.). **Phenothiazine—a promising new Insecticide.**—*Better Fruit* **31** no. 7 p. 5, 1 portr. Portland, Ore., February 1937.

In two years' experiments against the codling moth [*Cydia pomonella*, L.] on apples and pears in the north-western United States, the infestation of the fruit and the number of "stings" were over 50 and 90 per cent. less, respectively, on trees sprayed with 3 lb. phenothiazine [thiodiphenylamine] and a little soap in 100 U.S. gals. water than on trees sprayed with lead arsenate and soap at the same concentration. In these tests, the same number of cover sprays was applied and about 20 U.S. gals. were used for medium-sized trees. Where infestation was not heavy, 1½ lb. thiodiphenylamine in 100 U.S. gals. was also effective. Tests have shown that at least 90 per cent. of the very dark green residue can be easily removed. In 1935, the apples of one variety sprayed with 4 lb. thiodiphenylamine in 100 U.S. gals. were smaller and greener than those sprayed with lead arsenate, but in 1936, when extensive trials were carried out using 3 lb. per 100 U.S. gals., the size of apples or pears was not materially affected, although the colouring of red apples was somewhat reduced. There was no evidence that the trees were affected ; in some cases slight browning of the foliage occurred, but this was not consistent. Irritation of the skin was evident in men applying the spray and, in rare cases, in those harvesting the fruit, susceptibility to it increasing in hot weather. Thiodiphenylamine is at present more expensive than lead arsenate, as it is not yet being produced commercially. It cannot be recommended for general use until further investigated.

Taubenhaus (J. J.) & Christenson (L. D.). **Role of Insects in the Distribution of Cotton Wilt caused by** *Fusarium vasinfectum*.—*J. agric. Res.* **53** no. 9 pp. 703–712, 5 refs., 1 fig. Washington, D.C., 1st November 1936.

In experiments on the distribution of *Fusarium vasinfectum* (cotton wilt) by insects that feed on cotton in Texas, the fungus was successfully recovered from faecal pellets or entire insects of several species after they had been fed on roots, stems and leaves, or bolls of

infected plants [*R.A.E.*, A **22** 570]. It could not be recovered from, and was apparently destroyed while passing through, the alimentary tract of wireworms, Collembola and a Japygid, but was successfully cultured from larvae of *Alabama argillacea*, Hb., *Laphygma frugiperda*, S. & A., *Prodenia ornithogalli*, Gn., *Ataxia crypta*, Say, and Lamellicorns and from a number of grasshoppers. It was also recovered from 11 species of grasshoppers collected in badly wilted cotton fields. Tests with *Anthonomus grandis*, Boh., were inconclusive. Cotton seedlings were successfully inoculated with strains of *Fusarium* isolated from the alimentary canal of insects and with a pure culture of *F. vasinfectum* from infected cotton. *F. vasinfectum* survived for 15 months in faecal pellets from grasshoppers kept dry in the laboratory. It is suggested that these results may help to explain the occasional finding of infected plants in areas where the disease does not ordinarily occur.

NEEDHAM (J. G.) & others. **Culture Methods for Invertebrate Animals.**—Med. 8vo, xxxii + 590 pp., 85 figs. Ithaca, N.Y., Comstock Pubg. Co., Inc., 1937. Price $4.00.

This work includes a section (pp. 259–518) comprising short contributions by different authors on the rearing and maintenance of insects. The authors' aim was to obtain for at least one species of each order or considerable group a fairly complete account of maintenance requirements, covering collecting methods and devices, cages and breeding quarters, plans for feeding and watering and for cleaning and aerating quarters, breeding management, and all else that enters into the maintenance of the species through successive generations. Illustrations of apparatus are given, and references are appended to some of the contributions.

PETERSON (A.). **A Manual of Entomological Equipment and Methods. Part II.**—Demy 4to, 334 pp., 21 pls. St Louis, Mo., J. S. Swift Co., 1937. Price $4.50 plus postage.

In this second part [*cf. R.A.E.*, A **22** 632], an attempt is made to give abstracts of all information on rearing insects (except that on commercial rearing of bees and silkworms) that has appeared in entomological papers published in English. The abstracts are arranged alphabetically under authors, and some original contributions are included. Some abstracts are also given of information on marking insects, transporting living insects and specimens, collection, and photography related to insects, together with notes on laboratory and museum methods. Many illustrations of apparatus, and indices to the scientific and popular names of the insects and to equipment and methods are appended.

BONDAR (G.). **Notas biologicas sobre Bruchideos observados no Brasil.** [Biological Notes on Bruchids observed in Brazil.]—*Arch. Inst. Biol. veg.* **3** no. 1 pp. 7–44, 61 figs., 11 refs. Rio de Janeiro, December 1936.

Records are given of the occurrence in Brazil of some 50 species of Bruchids, with descriptive and biological notes on some of them. The eggs of a number of species are described, as their characters sometimes permit generic or even specific identification. Two species,

Pachymerus nucleorum, F., which infests the seeds of various palms [*R.A.E.*, A **10** 95], and *Spermophagus subfasciatus*, Boh., are dealt with in more detail than the others. *S. subfasciatus* is the Bruchid most injurious to stored leguminous seeds, especially beans and cowpeas, in Bahia and probably throughout Brazil. Zacher's observations on its bionomics are outlined [**17** 134, 580]. In Bahia 6–8 generations a year may be expected.

LEVER (R. A.). **Report of Entomologist for Year 1935–36.**—4 pp. [Tulagi] Brit. Solomon Is. Prot. agric. Comm., 1936.

All attempts to introduce the Eulophid, *Tetrastichodes brontispae*, Ferrière, whether from Java *via* Sydney or Rabaul or from Celebes *via* Brisbane, for the control of *Brontispa froggatti*, Sharp, on coconut in the Solomon Islands, have proved unsuccessful [*cf. R.A.E.*, A **24** 329, 569] on account of the low temperatures experienced during transit; the parasites had to be kept in cool storage at Rabaul while awaiting a ship. A consignment is therefore to be sent by air. Experiments showed that the fall of very young coconuts may be caused by *Amblypelta cocophaga*, China [**24** 568]. Arrangements are being made for the introduction of *Ooencyrtus malayensis*, Ferrière, an egg parasite of *Dasynus* [*piperis*, China], which is closely related to *Amblypelta* and infests pepper [*Piper nigrum*] in the Netherlands Indies [*cf.* **22** 60].

SLOAN (W. J. S.). **The Cotton Web-spinner.**—*Qd agric. J.* **46** no. 6 pp. 718–728, 10 figs. Brisbane, December 1936.

Loxostege affinitalis, Led., all stages of which are described, was first observed in Queensland in 1931, but occurred chiefly on uncultivated plants until the 1935–36 season, when it caused considerable losses to seedling cotton in the eastern districts. It was widely distributed and, in addition to cotton, attacked lucerne, potato, tobacco, maize, *Atriplex* spp., which are used as a winter food for stock, and weeds. Lucerne was the only cultivated crop on which eggs were laid. The 1935 outbreak followed good winter and early spring rains. Eggs were abundant in September, and larvae in October. During November and December, which were very dry, few adults and no larvae were seen, but in the middle of January, after a week of rain, large numbers of adults appeared and gave rise to abundant larvae. Adults were again present in the middle of February, but, although fresh food-plants were plentiful, no oviposition was observed in the field and no larvae were found subsequently; unusually heavy rain occurred at the time of peak emergence, followed by a hot dry spell that continued unbroken until March. The eggs laid in January were deposited in small batches on the tender tips of the plants and hatched in 2–4 days. The larvae developed in about 3 weeks and pupated in tunnels of web and débris about an inch below the surface of the ground, the pupal stage, which began a few days after the soil was entered, lasting 7 days.

Injury to weeds consisted in defoliation and reduction of seed production, but would only have become a significant factor in their control if the feeding period had been much longer. The two broods of larvae differed in their choice of wild food-plants. The yield and quality of lucerne was reduced by the feeding and webbing of young larvae hatching from eggs laid on the tender shoots. Cotton and maize

were defoliated by larvae migrating from weeds growing among them or from weeds or lucerne in the neighbourhood. When *L. affinitalis* and *Heliothis armigera*, Hb. (*obsoleta*, F.) occurred together in great numbers, *H. armigera* usually migrated first, but if food was scarce both migrated together. Seedling cotton was often completely destroyed and older cotton defoliated; bolls were normally unaffected, but squares and flowers were occasionally slightly injured.

The larvae were attacked by green ants, Ichneumonid, Braconid and Tachinid parasites and the Pentatomid, *Oechalia consocialis*, Boisd. One or two pupae were found to be attacked by a fungus. Control is best effected by keeping the fields and surroundings free from weeds and cutting lucerne as soon as it is found to be infested. In the case of cotton, 85 per cent. control was obtained in 48 hours by swabbing infested plants and neighbouring weeds with a mixture of 1 lb. lead arsenate, 1 gal. molasses or 7 lb. treacle, and 6 gals. water, at the rate of 3 gals. to 1,000 yards of cotton, 2 months old. Dusting with calcium arsenate (10 lb. per acre) was only half as effective. If seedlings are less than a fortnight old, replanting after treatment is usually necessary. To prevent migration, a furrow baited with a crumbly mash of 25 lb. bran, 2 qts. molasses, 1 lb. Paris green and 2–2½ gals. water may be used, or alternatively a barrier, 6 ins. high, of freshly cut weeds that are favourite food-plants, dipped in the swabbing mixture.

DAVIDSON (J.). **On the Ecology of the Black-tipped Locust** (*Chortoicetes terminifera* **Walk.**) **in South Australia.**—*Trans. roy. Soc. S. Aust.* **60** pp. 137–152, 4 maps, 22 refs. Adelaide, 1936.

The synonymy of *Chortoicetes terminifera*, Wlk., which it is proposed to call "the black-tipped locust," is discussed, the outbreaks of it in South Australia since 1844 are enumerated, and the hoppers, adults, eggs and egg-pods are described, together with some notes on oviposition, the development of the eggs, and the habits and food-preferences of the hoppers and adults. An account is given of the physiography, climate and vegetation of South Australia and of the course of the last outbreak [*cf. R.A.E.*, A **23** 129; **24** 69]. The first generation of winged swarms appeared in the pastoral zone in the northern part of the State in the summer of 1932–33. The second generation hatched in the spring of 1933, advanced southwards into the zone bordering the wheat belt and laid eggs there. The third generation swarms invaded the wheat belt in the summer of 1933–34; and during the peak summer of 1934–35, the fourth generation spread over a large part of the agricultural area of the State. The development of the outbreak in the pastoral zone was favoured by abnormally heavy rains during the first two summers, and its continuation in the wheat belt by the dryness of the autumn of 1934, which caused the hoppers of the fourth generation to hatch towards the spring, instead of in the autumn, and thus escape the unfavourable cold and wet winter conditions.

The decline of the outbreak in 1935 was partly due to widespread mortality of the hoppers of the fifth generation, which was probably due to extreme dryness and lack of green food, and to the extensive parasitism of the egg-pods by *Scelio fulgidus*, Crwf. [*cf.* **24** 69–70]. The emergence of the parasite from the locust egg-pod is arrested if the soil dries up, but is resumed if it is moistened more than a month later.

Pangga (G. A.). **Preservative for Wooden and Bamboo Posts against Ground-inhabiting Termites.**—*Philipp. Agric.* **25** no. 8 pp. 680–688, 10 refs. Los Baños, P.I., January 1937.

Experiments were carried out in the Philippines in protecting posts of bamboo or wood (*Leucaena glauca*) from subterranean termites to test the value of dipping the lower part of the posts in coal tar or setting them in holes in which about 3 handfuls of salt or 3 tablespoonfuls of Paris Green had been scattered.

The percentages of wooden posts attacked and (in brackets) the average number of days between the setting of the posts and the beginning of attack were 93·3 (340) for no treatment, 90 (354) for coal-tar, 66·67 (391) for salt, and 70 (412) for Paris green. The corresponding figures for bamboo posts were 80 (350), 70 (363), 60 (381) and 40 (427). The termites concerned were *Macrotermes gilvus*, Hag., and *Microcerotermes losbanosensis*, Oshima, the former being much the more destructive and the only one attacking the bamboo posts.

Pruthi (H. S.). **Report of the Imperial Entomologist.**—*Sci. Rep. Inst. agric. Res. Pusa 1934–35* pp. 141–152, 1 pl. Delhi, 1936.

An examination of about 11,000 sugar-canes of two varieties from different fields at Pusa [*cf. R.A.E.*, A **24** 668] at the time of the harvest of the 1934–35 crop showed the percentage of healthy canes, and of canes infested with *Scirpophaga nivella*, F., *Emmalocera depressella*, Swinh., termites and *Diatraea* (*Argyria*) *sticticraspis*, Hmps., *D. venosata*, Wlk., and *Chilo zonellus*, Swinh., together to be 22·36, 55·37, 45·22, 1·08 and 15·40, respectively, for one variety and 5·75, 82·11, 43·11, 9·59 and 60·95 for the other. The economic loss due to the infestation by *E. depressella* was very small. Crops planted in October and ratoon crops were more severely attacked by borers than those planted in February, and were a source of infestation for the latter. In all crops, the number of dead hearts increased considerably after May. *Trichogramma minutum*, Riley, parasitised the eggs of *E. depressella*, at the rate of 3–4 per cent. until the end of May and 40 per cent. in June, there being usually 3 parasites per egg. The life-cycle was completed in 7 days in the laboratory. Of the larvae of *E. depressella*, 3–4 per cent. were parasitised by the Braconid, *Stenobracon* (*Glyptomorpha*) *deesae*, Cam., up to the end of June, and 10 per cent. by a Bethylid, but only in winter when the cane is already damaged. *Apanteles flavipes*, Cam., parasitised *D. sticticraspis* late in the season, 40–80 parasites being found in one borer. Other sugar-cane pests observed were *Asamangulia cuspidata*, Maulik, *Brumus suturalis*, F., *Myllocerus blandus*, Fst., *Monolepta signata*, Ol., *Formicomus* sp., *Myllocerus undecimpustulatus*, Fst., *Calocoris angustatus*, Leth., *Aleurolobus barodensis*, Mask., *Aphis sacchari*, Zehnt., *Lepidosaphes* sp., *Trionymus sacchari*, Ckll., *Proutista* (*Assamia*) *moesta*, Westw., *Pyrilla* spp., and *Anaphothrips citricinctus*, Bagn.

Of some 125 tobacco plants tested to determine whether *Cyrtopeltis* (*Engytatus*) *tenuis*, Reut., transmits leaf-curl, about 12 showed abnormal growth, but none the complete symptoms of the disease. Experiments are being continued with this and other possible vectors of the disease, which is spreading rapidly at Pusa.

A Cecidomyiid that damaged linseed flowers to the extent of 50 per cent. in 1933 and 15 per cent. in 1935 has recently been described

as *Dasyneura lini*, Barnes. The adults, which are most active during the brightest part of the day, hover from plant to plant, laying eggs on or in the flower buds. The larvae make their way into the buds and feed on the stamens and other internal organs of the flower. The larval stage lasts about 7 days, and the pupal stage, which is passed in the soil, lasted 4–7 days in the laboratory at a temperature of 70–82°F. Varieties of linseed imported from Australia were more heavily attacked than the indigenous ones.

Among the important pests of other plants that occurred during the year were *Sylepta lunalis*, Gn., on grape-vines, *Euzophera perticella*, Rag., and *Leucinodes orbonalis*, Gn., on brinjal [*Solanum melongena*], *Pempheres affinis*, Fst., on cotton, *Nupserha bicolor*, Thoms., on soy beans, *Pulvinaria psidii*, Mask., on young grafted mango plants, *Psylla* (*Arytaina*) *isitis*, Buckt., on indigo, *Euchrysops cnejus*, F., and *Exelastis atomosa*, Wlsm., on *Cajanus indicus*, *Laphygma exigua*, Hb., on lucerne, *Raphidopalpa* (*Aulacophora*) *abdominalis*, F., and *Margaronia indica*, Saund., on cucurbits, and *Trabala vishnu*, Lef., on *Quisqualis indica*.

The occurrence of the following insects on the food-plants named is specially noted: *Prodenia litura*, F., on berseem [*Trifolium alexandrinum*], *Cyrtopeltis tenuis* on bottle gourd, *Virachola isocrates*, F., on the fruit of litchees, *Mabra eryxalis*, Wlk., on rice, and *Tischeria ptarmica*, Meyr., mining leaves of *Zizyphus jujuba*.

Agriculture and Animal Husbandry in India 1933–34 & 1934–35 Pt. I. —Crop Production.—390 pp., 1 map. Delhi, 1936.

Much of the information on insect pests (pp. 186–202) in this review of work in India has already been noticed. In the Punjab, infestation of sugar-cane by *Scirpophaga nivella*, F., varied from 25 to 85 per cent. according to the variety. Hard and narrow-leaved varieties appeared to be resistant to *Pyrilla*, which was injurious on softer ones. In Burma, it was proved that cane can be grown in fields that have been ploughed up and left fallow for a full season, without fear of serious damage by *Alissonotum impressicole*, Arr. Two other Dynastids, *Heteronychus lioderes*, Redt., and *A. crassum*, Arr., were increasing, but not yet very injurious. In Assam, *Emmalocera depressella*, Swinh., was rare, *S. nivella* was the dominant moth-borer early in the season, and *Diatraea* (*Argyria*) *sticticraspis*, Hmps., and *Diatraea venosata*, Wlk., in mature canes. The percentage of attack by borers was 5–15 until January, 60·1 in February and 16·8 in March.

The pink bollworm [*Platyedra gossypiella*, Saund.] was injurious on cotton in the United Provinces in 1933, owing to abnormal rains, so that sun-heating of the seed did not give such good results as usual. It was observed in the Madras Presidency that *Pempheres affinis*, Fst., continues to emerge from pulled out cotton stalks for two months, so that a close season should last at least three months.

Irrigation of rice and treatment of the water with kerosene were found effective in Madras against larvae of *Spodoptera mauritia*, Boisd., which were also successfully destroyed by dusting with calcium arsenate and lime (1 : 8), and damage by *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) was appreciably reduced if plant growth was accelerated by a top-dressing of ammonium sulphate. In Bengal, *Cirphis unipuncta*, Haw., and *S. bipunctifer* damaged rice, the latter

being most injurious in water-logged transplanted plots, where it was controlled by letting the excess water out. Other rice pests included *Nymphula depunctalis*, Gn., and *Leptocorisa varicornis*, F., in Assam, and *Pachydiplosis oryzae*, Wood-Mason, which was injurious in 1933 in the Central Provinces and also in Mysore, where it appeared for the first time in 30 years.

Mangos were infested by *Drosicha* (*Monophlebus*) *stebbingi*, Green, in the United Provinces and by *Cryptorrhynchus gravis*, F., in Bengal, and orange trees in Assam were severely damaged by *Monochamus versteegi*, Rits., which has only one generation a year, the adults emerging in April and ovipositing in July. Investigations in Bombay on *Rhopalosiphum pseudobrassicae*, Davis (*Siphocoryne indobrassicae*, Das), *Brevicoryne brassicae*, L., and *Myzus persicae*, Sulz., on vegetables showed that their life-histories are almost alike in essential points; they mature in about 4 days and live about 2 months. *Scirtothrips dorsalis*, Hood, and *Thrips tabaci*, Lind., were found breeding on chillies [*Capsicum*] and onions throughout the year; the life-cycle of each species occupied 17–18 days. *Agrotis ypsilon*, Hfn., was injurious on potatoes in Assam. In Mysore, a 10 per cent. water extract of the root of *Randia dumetorum* gave 80 per cent. mortality of *Coccus viridis*, Green.

HARGREAVES (H.). **Report of the Government Entomologist for 1935.**— *Rep. Dep. Agric. Uganda 1935–36* pt. 2 pp. 8–11, 2 refs. Entebbe, 1936.

Eggs deposited by *Nomadacris* [*septemfasciata*, Serv.] in Uganda late in 1934 [*cf. R.A.E.*, A **24** 377] gave rise to small scattered bands of hoppers in January 1935, but, owing to control measures and destruction by birds, these did not associate into swarms. During July, a number of swarms crossed the southern border of the Protectorate in four districts, in three of which some damage was caused; but by September and October, infestation was confined to one district. During November, the swarms were possibly dispersed by the rain, as no locusts were reported from any districts. Further swarms entered from the south in December. Apparently the climate of Uganda is unfavourable to the continuous existence of this locust in dangerous numbers. Only a few swarms of *Locusta* [*migratoria migratorioides*, R. & F.] were observed before February 1935 and none after.

Dried cowdung impregnated with either discarded sump oil from petrol engines or cotton-seed "tar" gave very dense smoke for facilitating the collection of *Antestia* on coffee [*cf.* **13** 352]. It was observed that eggs and young nymphs of this bug were very rare when the coffee seeds were hard, which supports the suggestion that females require berries as food in order to oviposit [**24** 648]. *Dirphya princeps*, Jord. (coffee stem-borer) is generally abundant in March and April, and a Braconid parasite of the larvae, *Bathyaulax* sp., became common at the end of that period. In some localities *Habrochila* sp., possibly *H. placida*, Horv., was very abundant on some coffee trees but not on neighbouring ones; possibly this Tingid is attracted by some special constituent of the sap of certain coffee trees. A predacious Capsid, possibly *Opistocyclus* sp., is an important natural enemy. In one locality, the heavy crop of coffee berries of the previous season fell among the mulch and this, combined with dense

shade, gave rise to a severe infestation of *Stephanoderes hampei*, Ferr., which was finally controlled by shade reduction and by parasites. In 1935, there was a marked decrease in infestation by *S. hampei* on 3 plantations of *Coffea robusta* in Toro where *Prorops* [*nasuta*, Wtstn.] had been liberated in 1935. Five species of *Stephanoderes*, including *S. hampei*, were found in the field in seeds of lima beans (*Phaseolus lunatus*). The leaf-nesting ants, *Macromischoides aculeatus*, Mayr., and *Oecophylla smaragdina longinoda*, Latr., which interfere with the picking of the coffee berries, may be controlled by spraying with a kerosene extract of pyrethrum or dusting with pyrethrum during the dry season to prevent the production of winged forms and new nests. Other insects that occurred on coffee were *Lycidocoris mimeticus*, R. & P., attack by which is associated with dense shade, *Bixadus sierricola*, White, and *Epicampoptera* (*Metadrepana*) *marantica*, Tams.

Termites attacked the roots of *Antirrhinum* that were suffering from root disease, and also sugar-cane setts (in many cases diseased) in areas where germination was not completed before a long period of dry weather. Sap-feeding ants, which nested in the soil near the bases of the trees, caused severe damage to the bark of *Maesopsis* in a forestry plantation. The injury was prevented by the cessation of clean weeding. The tea crop continued free from serious infestation by insects. *Helopeltis bergrothi*, Reut., caused some injury to young transplanted plants, and *H. maynéi*, Ghesq., which had earlier been found breeding on *Fuchsia*, was associated with typical damage to the leaves of seed-bearing tea. Other pests observed during the year included *Orthezia insignis*, Dougl., on *Duranta* and *Gerbera*, beetles of the genus *Megalognatha* attacking the flowers of avocaod and the tassels and young cobs of maize, and *Euxoa longidentifera*, Hmps., and *Euproctis* (*Porthesia*) *producta*, Wlk., on cotton. Of the final consignment [*cf.* **24** 377] of 845 adults of *Plaesius javanus*, Er., the Histerid predacious on the banana weevil [*Cosmopolites sordidus*, Germ.], which were received from Java in late May, 83 were alive on arrival, but only 27 survived the quarantine period. These were liberated early in July.

GWYNN (A. M.). **Report of Assistant Entomologist.**—*Rep. Dep. Agric. Uganda 1935–36* pt. 2 pp. 12–18. Entebbe, 1936.

This report deals with the work carried out in 1935 against certain pests of cotton in the Eastern Province and Lango, Uganda. The infestation by Jassids [*cf. R.A.E.*, A **24** 376] was light, but the maximum population of 400 nymphs on a sample of 500 leaves from 50 plants, which occurred during November, was associated with considerable reddening of the leaves. The varieties of cotton, and also the blocks of plants irrespective of variety, with high populations of Jassids showed more reddening of the leaves than those with lower ones. In the absence of a high population, a variety of cotton susceptible to attack and two resistant ones showed about the same amount of physiological reddening. A plot that had been treated with compost before being planted with cotton had a lower population of Jassids and less reddening than one alongside it that had had no compost.

Dysdercus nigrofasciatus, Stål, *D. superstitiosus*, F., and *D. cardinalis*, Gerst. (which was much less common than the other two) occurred on cotton, but only became numerous in December, after

which the population again declined, probably through migration from the crop. The severity of infestation and the relative proportions of the two main species concerned varied greatly among the different blocks of cotton. On the lightly infested blocks, *D. nigrofasciatus* formed the majority of the population throughout the season ; on the more heavily infested blocks, the majority of the original immigrants were *D. supersititiosus*, but later in the season *D. nigrofasciatus* was in the majority on these blocks as well. Little stain occurred until the end of the season, when about 75 per cent. of the blocks were badly stained and the loss was considerable ; most of the infection was carried by *Dysdercus*. There was less staining on native-grown cotton, possibly because it did not become infested till later in the season as it was planted later. Tests showed that 60 per cent. of seed from clean cotton germinated, but only about 30 per cent. of seed from very stained cotton.

Damage to cotton by *Lygus simonyi*, Reut., was severe in many localities, but declined from September onwards, when the population was small. This Capsid appears to attack all varieties more or less indiscriminately. The main areas of heavy and light damage were constant throughout the season, while individual plots often showed very severe or very light damage over a period of 2 months. The plots were affected in the same way by Jassids. The variation can only be accounted for by soil factors. Infestation of cotton by *Helopeltis* [*bergrothi*, Reut.] was slight except in two localities. Soil samples were collected from adjacent plots lightly and heavily attacked by it, and, in the Annual Report of the Agricultural Chemist (pp. 49–55), W. S. Martin states that the soils from the unattacked plots showed marked superiority to those from the attacked ones, both generally and in the content of phosphate and potash. The results of a single experiment indicated that some varieties of cotton were more susceptible to injury by *Helopeltis* than others.

Taylor (T. H. C.). **Report on a Year's Investigation of** *Platyedra gossypiella* **(Pink Boll Worm) in Uganda (March 1935 to April 1936).**—*Rep. Dep. Agric. Uganda 1935–36* pt. 2 pp. 19–39. Entebbe, 1936.

Platyedra gossypiella, Saund., which was first recorded in Uganda in 1931 [*R.A.E.*, A **21** 302], spread steadily [*cf.* **23** 10] until only the east and extreme south-west of the Protectorate were free from infestation in 1935–36. In 1936, it was present in 80 per cent. of the plots examined in the north-west, where it was first observed, and in about 50 per cent. in other parts of the infested area. The mean infestation of bolls over most of the infested area was about 7 per cent.

A detailed account is given of a study of its bionomics in Uganda, with special reference to points in which they differ from those recorded from some other countries. Eggs are deposited, usually in small groups, on any part of the cotton plant, but generally in sheltered situations. The egg, larval (including prepupal) and pupal stages lasted 5–6, 14–17, and 9–10½ days, respectively, in the laboratory in fairly hot weather, and the length of the larval stage was confirmed in the field by artificially infesting half-grown bolls. The last of the four larval instars lasted 8 days, including a non-feeding prepupal period of 2½ days. In colder weather, the stages are longer, and the

life-cycle averages 38 days. Moths fed on honey live for 14 days or more, and the normal duration of adult life is probably about 3 weeks in the field. Normal females apparently lay 350–500 eggs, the oviposition period lasting about 17 days. As the average duration of one generation is about 40 days, about $4\frac{1}{2}$ generations are completed in a season.

The majority of eggs are laid on bolls, and when buds, flowers and bolls of all sizes are available, a preference is shown for half-grown bolls. The moths oviposited readily in captivity, 60 per cent. of the females giving fertile eggs ; the technique of rearing is described. Larvae can mature only in the interior of buds, flowers or bolls, and those that hatch on other parts of the plant have to wander relatively long distances to find suitable food. Within two hours of hatching, the larvae on the buds and bolls attempt to bore into them ; on the former they always appear to be successful, but not on the latter. Larvae mature at the same rate on fresh buds, fresh flowers or fresh immature bolls. Infested buds develop normally until the larvae are in the 4th instar, when they are severely injured and most of them are shed. Within the bolls, the preferred food is the immature seeds. A series of experiments indicated that open mature bolls, cotton seed, and seed cotton are not suitable food for the larvae, and negligible numbers mature therein. The accumulation of dead and rotten buds, flowers and young bolls often present beneath cotton plants is, in wet weather, an important source of food for larvae falling to the ground within buds or young bolls that are shed. The larvae attack one another and also destroy larvae of *Argyroploce leucotreta*, Meyr., that occur in the same bolls.

Although in the north-west of Uganda and the dry hot parts of Buganda pupation takes place on or in the soil, in the cooler and more humid parts at least 30 per cent., and in very cool weather probably about 50 per cent., of the larvae pupate within the bolls. In areas where the shade temperature exceeds 85°F. for several hours each day (relative humidity 30–40 per cent.), the larvae drop to the ground, and where the shade temperature seldom exceeds 80°F. (humidity greater than 55 per cent.), they pupate within the bolls. As the humidity within the larval burrow must remain high, this habit is probably more closely associated with temperature. In the cooler parts of Uganda, larvae that leave the bolls pupate on the surface of the soil.

Larvae in the resting stage are entirely absent in the wetter districts of Uganda even in dry weather, and although they have been shown to occur [*cf.* **24** 377] in the hotter districts (particularly the north-west), none was found during the hot weather at the end of the 1935–36 season. In all parts of the country, the normal short-cycle development continues throughout the season. It is thus apparent that the following factors, which compose the climate of Uganda, together induce short-cycle development : 40-60 ins. rainfall distributed through most months of the year ; mean daily humidity over 50 per cent. ; mean daily temperature about 70°F. with a daily range of about 50–90°F. A comparison of the climate of countries in which the resting stage occurs shows that long periods (several months) of complete drought, day temperatures exceeding 95°F., and low humidity are the factors associated collectively with the resting stage. As resting continues to occur in such countries after the advent of cooler weather, it appears that lack of moisture is the chief cause of the resting stage, and high temperature is only a contributory factor. A preliminary

experiment in which fully grown larvae that were still feeding were exposed for 10 days to different relative humidities proved that at a mean daily temperature of 78·5°F. with a mean daily maximum of 82·5°F., larvae that had fed on immature bolls throughout nearly all of their feeding period showed no tendency to enter the resting stage when full-grown, whatever humidity they were then exposed to. Constant humidities of 10, 20, 90 and 100 per cent. were fatal at these temperatures. When larvae were maintained from the end of the 2nd instar at 30 per cent. humidity and fed on small immature bolls dried in the sun, only 6 out of 20 survived, all of which constructed typical resting cocoons and entered a resting stage of 1–3 months, which was terminated by pupation. In another experiment, 20 nearly full-grown larvae collected from almost mature bolls were placed in each of two tins without lids, which were half-filled with seed-cotton, dry except for the moisture in the seeds. One of the tins was exposed in the sun, where the temperature probably exceeded 110°F. on each of the 4 following days, while the other was kept in the shade, where the maximum temperature was 92–96°F. and the minimum 72–74° F., and the relative humidity varied from about 30 per cent. (at 2.30 p.m.) to 70 per cent. (at 6.0 a.m.). In the tin in the sun only 2 larvae pupated in the normal short-cycle period ; the other 18 entered the resting stage and had not pupated after 3 months. All the larvae in the tin in the shade pupated within 3 days of collection. In the locality from which these larvae were collected, no resting larvae were found in the field. From these experiments, it is concluded that the resting stage is caused by any factor that reduces the water content of the body, such as abnormally high temperature with low humidity, which results in excessive evaporation from the larva itself, or dry food at low humidity over a long period, which results in an inadequate water supply from within. Experiments on the resting larvae of *P. erebodoxa*, Meyr., and another species of *Platyedra* that feeds on *Dombeya emarginata* showed conclusively that the resting stage of these two species, which was induced by similar conditions to that of *P. gossypiella*, was terminated by exposing the larvae to abundant moisture. Finally, on 20th March, of 18 larvae of *P. gossypiella* that had been induced to enter the resting stage 2 months before, 9 were placed in a sealed jar over water, and 9 in a similar jar with no water. In the first jar, one larva pupated after 14 days, and the remainder after 22 days ; those in the second jar were still resting in May.

The hot dry weather that would cause many larvae to enter the resting stage is abnormal in Uganda, and, if it should occur, pupation would probably take place as soon as the rains began if these were normal or heavy, so that the moths would emerge before many buds or bolls of the next cotton crop were produced. The resting stage is therefore not likely ever to be important in Uganda in normal or very wet years.

A list is given of 1 egg parasite, 9 larval parasites and 2 pupal parasites that attack *P. gossypiella* in Uganda, of which the identified species are *Microbracon kirkpatricki*, Wlkn., which is extremely rare, *Chelonus* (*Chelonella*) *ritchiei*, Wlkn., *Apanteles diparopsidis*, Lyle, *Brachymeria olethrius*, Wtstn., and *Elasmus johnstoni*, Ferrière. The mite, *Pediculoides ventricosus*, Newp., sometimes attacks the larvae of *P. gossypiella*. The parasites are of little economic value, because most of them have too many alternative hosts, few reach the larvae inside the bolls, and most attack them only on *Hibiscus*. The total parasitism

on cotton does not exceed 10 per cent., whereas that on *H. macranthus* amounts to about 50 per cent.

The results are given of a year's observation on the prevalence of *P. gossypiella*. At the beginning of the season it is only present in a small percentage of plots, in which infestation rarely amounts to 1 per cent. ; in this case no appreciable damage is done until the very end of the season, when about 25 per cent. of the bolls are infested. Occasionally the initial infestation is 2 per cent. or more and 50–75 per cent. of the bolls are infested by the last picking. The damage done to the cotton crop as a whole is very small, and it is concluded that it will not be serious in normal or very wet years. Satisfactory control is apparently to be obtained by the rigid enforcement of a closed season for cotton and the shortening of the growing season as far as possible. It seems that these measures will be sufficient owing to the lack of entirely suitable alternative food-plants in which the larvae can pass the closed season and the absence of the resting stage. A survey of possible alternative food-plants showed that only *Hibiscus macranthus, H. esculentus* and *H. cannabinus* were attacked. Cotton was markedly preferred to them all, and *H. macranthus* to the other two. *H. macranthus* is entirely confined to the wetter areas, and the fruits are attacked comparatively commonly for about a month after the destruction of cotton at the end of the season, but rarely after this, owing to the spreading of the moths and their reluctance to oviposit on *Hibiscus*. *H. macranthus* thus only enables small numbers of larvae to survive in a few localities. *H. cannabinus* and *H. esculentus* are both present in the drier regions, but both are attacked rarely, and they do not flower to any appreciable extent during the hot dry months when no cotton is present.

Notes are given in an appendix (pp. 38–39) on the bionomics of 4 other species of *Platyedra*, the larvae of which may be confused with those of *P. gossypiella*. One of these species, which is unidentified, attacks cotton occasionally in the south of Uganda, and the larvae of two others accepted it in captivity.

Davies (R. M.). **The Control of White Stem Borer of Coffee.**— *E. Afr. agric. J.* **2** no. 4 pp. 293–297. Nairobi, January 1937.

The object of this paper is to restate conclusions published in annual reports of the late A. H. Ritchie on the control of *Anthores leuconotus*, Pasc., on coffee in northern Tanganyika, and also to make known the experience of planters and agricultural officers in carrying out control measures. This Lamiid is known to breed in five indigenous rubiaceous plants, *Oxycanthus speciosus, Randia* sp., *Vangueria* sp., *Pavetta oliveriana* and *Rytigynia schumanii*, but they are much less heavily infested than neglected coffee trees, which may contain up to 18 larvae each. Coffee trees weakened by attack produce only inferior beans. The eggs are laid under the bark at or above ground level. For 4 months after hatching, some of the larvae mine in the superficial root tissue, but most of them do so under the bark, producing slightly raised areas that render their detection possible. They then tunnel into the tree and eventually pupate there. Single-stemmed coffee trees simplify inspection and treatment, because crotches of those with several stems provide suitable places for oviposition. The production of stubs or rough outgrowths should be avoided, since at such points the grubs will be missed or difficult to extract. The

period of adult flight should be accurately determined, and the search for larvae begun 3–4 months later. In inspections earlier than this, they are likely to escape detection on account of their small size. The bark of the trees should be vigorously rubbed with Hessian cloth, so that the grubs beneath it may be readily seen and destroyed, and those already tunnelling in the tree should be extracted with wire. The use of paradichlorobenzene and similar chemicals for insertion in the grub holes is not recommended except where extraction involves the sacrifice of most or all of the tree. The root systems of whole and stumped trees should be examined and exposed close up to the central tap root; old infested trees are best uprooted and destroyed. In a block of 31,000 coffee trees, the numbers of adults and larvae were reduced from 5,014 and 41,397, collected in 2 months of the first year in which the above methods were applied, to 28 and 390, respectively, collected in 8 months of the fourth year. In native coffee plots, strictly supervised control has also given satisfactory results, and records from two districts in which infestation had formerly been most severe show that in only 7 per cent. of the total number of plots were any grubs found at all during the last campaign. The destruction of the indigenous food-plants has been made compulsory [*R.A.E.*, A **23** 559, etc.], and their eradication is reasonably complete within the boundaries of blocks of coffee. Their total eradication in the coffee-growing areas will, however, take time, as there are 20–30 trees per acre in some districts, and most of the species regenerate readily from the roots. The cost of control is briefly discussed.

MALLAMAIRE (A.). **Les principaux nématodes, myriapodes et insectes parasites des caféiers cultivés dans l'Ouest africain français.**—*Ann. agric. Afr. occ.* **1** no. 1 pp. 1–45, 7 pls., 6 pp. refs. Paris, January 1937.

This survey of the more important pests of coffee in French West Africa, including upwards of twenty insects, is based on the literature and comprises brief descriptions of the various species, notes on their distribution and bionomics and recommendations for their control.

BOUHÉLIER (R.) & HUDAULT (E.). **Un dangereux parasite de la vigne au Maroc** *Dorysthenes forficatus* **F. (Col. Céramb.).**—*Rev. Zool. agric.* **35** nos. 10–11 pp. 145–153, 173–176, 3 figs., 1 ref. Bordeaux, 1936.

The Prionid, *Dorysthenes forficatus*, F., which is fairly common in Morocco on dwarf palm (*Chamaerops humilis*), has recently caused considerable damage to young vines in the north-west. All stages are described. Eggs laid in June and July hatched in 20–25 days. In September and October 1935, numerous larvae were collected, most of which were 6–9 cm. long. A few, however, thought to be of the same species, were less than 5 cm. long and some little more than 1 cm. long, which indicates that the larval stage probably lasts three years. The pupal stage apparently lasted about 25 days, and adults emerging in cages lived 18–20 days.

Pairing takes place a few days after emergence, and is repeated several times during oviposition. Eggs are laid singly or in small

groups just below the surface of the soil. The larvae feed on the underground portions of their food-plants either internally or externally and pass from one plant to another by tunnelling through the soil. They sometimes attack the roots of dwarf palm, but usually ring the base of the main stem sufficiently deeply to cause the withering of the plant. In the case of vines, they sometimes eat away parts of the cortex, but more often feed in an ascending or descending mine, the entrance to which may be at the point of junction of the roots or higher. The injury, which is particularly noticeable from July onwards, weakens the plant so that it may be easily broken and cannot form fruit. It is worst in the case of young vines planted on land recently brought into cultivation, as such land frequently contains large numbers of dwarf palms before it is cultivated. In one plot of young vines, 32 per cent. of the plants were destroyed in 2 years, and in the 50 plantations where injury was observed, 5,000–6,000 vines 1–4 years old were destroyed in 3 years. It appears, however, that infestation does not spread readily to vineyards from dwarf palms in the neighbourhood. The pupal stage is passed in a strong chamber made of compressed earth and woody fibre. The adults were not seen to feed ; their flight is heavy and they are active mainly at dusk.

A few of the larvae in captivity were found to be parasitised by *Muscina stabulans*, Fall., but this had probably happened because they had been injured and had been kept without soil to shelter in. About 50 per cent. of the larvae were killed by *Beauveria* sp., which also attacked eggs, pupae and adults, while some eggs and larvae were destroyed by *Oospora* sp. Proposed control measures include the uprooting of withered plants in summer and the destruction of the larva that is usually found in each, and similar action in winter when the plants are being pruned, followed by the exposure of the bases of the plants as far as the roots and the destruction of all larvae found in the surrounding soil. In this way, 2,674 larvae were collected from less than 12½ acres of land without harm to the vines.

Delassus (—) & Laffond (—). **Les poudres insecticides à base de rotenone dans la lutte contre l'eudémis.**—*C. R. Acad. Agric. Fr.* **23** no. 6 pp. 181–189, 1 ref. Paris, 1937.

Further experiments [*cf. R.A.E.*, A **24** 276] were carried out in Algeria in 1936 with dusts impregnated with various amounts of rotenone and allied substances extractable with ether against the third generation of *Polychrosis botrana*, Schiff., on grapes. It was found that two applications of a dust containing 2 per cent. total extractives, at the rate of about 14 lb. per acre, gave satisfactory results, and that it would not be worth while to use a stronger dust.

Bishara (I.). **Some Pink Bollworm Studies in Egypt.**—*Bull. Minist. Agric. Egypt* no. 163, 32 pp., 27 figs., 1 map, 1 ref. Cairo, 1936. Price *P.T.* 6.

Further work on the infestation of cotton by *Platyedra gossypiella*, Saund., in Egypt [*cf. R.A.E.*, A **12** 281] showed that about 70 per cent. of the larvae found at the end of the season are those in the resting stage in the seed of pickable cotton, but hot air treatment of the seed [**23** 218, etc.] now produces a mortality rate of 99 per

cent., and the total bollworm damage has thus been reduced by more than 50 per cent. Confirmation was obtained of the importance, as sources of infestation, of discarded bolls and locks left on the ground and buried when ploughing the land for winter crops [**21** 642], and of those left on the cotton sticks and stored on the roofs of the villagers [**22** 681]. The latter produce about 90 per cent. of the adults likely to breed on the new cotton crop. Owing to the scarcity of fuel, it is impossible to burn the cotton sticks, but, in a large scale experiment, money was awarded to villagers for stripping and burning the refuse bolls from the sticks; it is hoped to publish the results of this work at a later date.

Graphs and tables are given showing the seasonal and local variation in the time of emergence of the moths from the refuse bolls left on stored cotton sticks and the numbers emerging from every 1,000 bolls, the average being 25–30 in the Delta. Taking into consideration these data and the gradual consumption from November to July of the sticks for fuel, the maximum emergence was found to occur from mid-April to mid-May in Lower Egypt, though moderate numbers are still emerging in June and July and occasional individuals until September. In Upper Egypt, emergence begins and ends earlier. The larvae cannot develop on cotton till flower-buds are available, and many of the moths that emerge early do not live long enough to cause infestation. Experiments indicated that moths usually live for 2–4 weeks and that infestation will vary with the season, the growing conditions of the cotton, and the distance between the fields and the places where the sticks are stored.

Progress Reports from Experimental Stations Season 1935–36.— Med 8vo, v + 140 pp., ill. London, Emp. Cott. Gr. Corp., 1937. Price 2*s.* 6*d.*

The pests of cotton in Africa during 1935–36 are discussed as in previous years [*cf. R.A.E.*, A **24** 279, etc.]. F. S. Parsons and J. Marshall (pp. 29–36) report from Barberton (eastern Transvaal) that as a result of the reduction in the infestation of the American bollworm [*Heliothis armigera*, Hb.] on cotton in the summer of 1935, owing to virus disease, the August–September oviposition was only one-fifth of that in 1934. At this season, egg-laying is largely concentrated on peas, on which larval survival is high. Oviposition on winter crops was finished by early November, and, owing to the late rainfall and the consequent lack of wild and cultivated food-plants, the summer bollworm attack did not occur until March, and was not serious, except where ratoon cotton or irrigated early maize and weeds maintained the infestation. At all recording points in the Barberton area, Swaziland and Zululand, the summer oviposition was almost exclusively on maize. The subsequent winter breeding was the lowest for 5 years, but a rapid multiplication was anticipated, owing to early and abundant rainfall.

Observations on weeds as alternative food-plants of *H. armigera* between winter and summer crops showed that those remaining in irrigated plots (such as *Datura* and *Physalis*) are of great importance. In tests of the relative attractiveness to the ovipositing moths of 9 different crops, including maize and cotton, oviposition on chick-pea (*Cicer arietinum*) preponderated and larvae migrated to it from other

plants. This confirms experiments elsewhere [*cf.* **19** 160]. Comparative tests in which larvae were fed on maize and cotton showed no differences in rate of development or size of larvae or pupae. Egg-production was correlated with the size and weight of the moths, but the average number of eggs produced (including those found on dissection after death) by females bred on maize (1,720) exceeded that of those bred on cotton (1,585). This increased fecundity is counteracted by the increased mortality of eggs and larvae on maize, so that in practice infestations are equal. In a preliminary experiment, dusts of cryolite and calcium arsenate gave promising results against the larvae on winter peas.

The increasing incidence of red bollworm [*Diparopsis castanea*, Hmps.] at Barberton is due to ratoon and other stand-over cotton; the practice of ratooning is increasing. In Swaziland, it bred continuously on *Cienfugosia hildebrandti* from September to June in favoured situations and from October to May in others, and on wild cotton (which fruits later) from November to June. Ratoon cotton supplements these food-plants. Oviposition on wild cotton is heavier than on *Cienfugosia*, but survival is less, and *Cienfugosia* is much the more abundant. It is, however, confined to country under 1,000 ft. in altitude and does not occur to the west of longitude 31°30′E., where the main cotton-growing area is situated and where the discovery of further food-plants is unlikely.

E. O. Pearson (pp. 37–42) reports further observations on cotton stainers (*Dysdercus* spp.). *Sterculia rogersi*, their most important tree host, normally has two fruiting periods at low altitudes, a small crop in June–August and the main crop in November. The winter crop, however, is absent in the Barberton area. In the Ingwavuma district, the winter crop is generally accompanied by an influx of stainers, but this has not been observed in Swaziland. *D. intermedius*, Dist., was present on the trees in the former district from August to February, with the main immigration in November, as in Barberton and Swaziland. No F_1 adults matured owing to drought, but late-instar nymphs moved to adjacent herbaceous food-plants in January. *D. nigrofasciatus*, Stål, was present on *S. rogersi* from August to December, but did not appear on it in the other two districts. Infestation records were impaired by the drought, but in north Swaziland infestation by *D. nigrofasciatus* on *Hibiscus calyphyllus*, which began in November with a small population of nymphs and adults, increased until mid-July, with a peak in early March, after which the numbers of adults fell till August, when the population was almost zero. Records on other species of *Hibiscus* were similar. The author concludes that a regular sequence of food-plants does not exist, and a proportion of them may suffice to maintain an infestation. The period between the cessation of active breeding in July and the October–November rains may be passed by *D. fasciatus* on *Dombeya rotundifolia*, a small sterculaceous tree that is common on rocky hill slopes and the margins of small watercourses in the middle and low veldt and flowers in August. Adults were observed on shaded flowering trees from mid-August until September, and third-instar nymphs in late October; a single generation would bridge the gap until the main crop of *Sterculia* is available. Adults were also observed in early September on *Acacia pallens*, and in late September they migrated from cotton lands to *Gymnosporia acuminata*, a celastraceous evergreen that flowers in September, where they remained

about a month until flowering was finished. No mating pairs or nymphs were observed on *G. acuminata*, and feeding was confined to the flower nectaries. Similar supplies of nectar from various trees may allow these months to be passed in the adult stage.

Owing to the late cotton crop in most districts and defoliation and bad opening of bolls, infestation by stainers was varied. *D. intermedius* was rare in the Magut district and not numerous in Swaziland, while initial migrations to the Barberton area were greater than usual and in an increased ratio to *D. nigrofasciatus*. The evidence seems to show that infestation is lower in areas in which *S. rogersi* is absent, and that the number of fifth-instar nymphs is 2–8 times as great as the number of adults, there being a strong tendency to migrate from cotton after the final moult. Infestation by *D. nigrofasciatus* was low in the Barberton and Magut areas, and immigrations averaged less than 400 per acre, while peak populations did not exceed 1,000. In Swaziland, initial migrations averaged 1,000 per acre, coinciding with boll-opening, and a population of about 12,000 per acre was formed after the bulk of the crop had opened. The average degree of staining nowhere exceeded 10 per cent. It seems unlikely that, where infestations occur in the order normally recorded and at or shortly before a boll-opening that is completed in two months, stainers migrating from their natural food-plants are a serious factor in the cultivation of rain-grown cotton.

Experiments on boll-feeding by the nymphs showed that under field conditions the second and third instars feed only on bolls up to 3 weeks old, while later ones feed on all stages, but mainly on bolls 2–6 weeks old. Puncturing rates were higher for the later instars. Investigations in which nymphs fed on green bolls inoculated with *Nematospora gossypii* were transferred immediately to sterile bolls showed that 17 individuals out of 18 were infective, but when 75 individuals were allowed to moult before being transferred, only 1 was. Transmission of *Nematospora* is thus purely mechanical.

A. H. McKinstry and A. N. Prentice (pp. 60–66) report from Southern Rhodesia that egg-laying by *H. armigera* on cotton, which lasted 4 months, was heavier than in the previous season, but lighter than in 1933–34. The main period was from 12th March to 10th April and closely followed cotton flowering. Other crops, however, attracted oviposition in varying degrees, and *Dolichos* [*lablab*] in particular was more attractive than cotton even during the period of main oviposition on the latter. The numbers of larvae that reached the sixth instar were greater, and the damage to large, well-formed bolls was much more severe than usual. *H. armigera*, rather than *D. castanea*, appears to have caused most of the damage. Oviposition by *D. castanea* may take place from mid-October to January–March and possibly longer, but the curves for different seasons do not coincide, probably owing to climatic influences. Oviposition on the young plants of the past 3 annual crops began during the last week in January or early in February, and where only annual cotton is grown, remained at a low level for about 7 weeks. The life-cycle is then completed and egg-laying increases.

Stainers were recorded in mid-March, and *D. fasciatus*, which showed marked increase in June, outnumbered both *D. superstitiosus*, F., and *D. intermedius*. Bolls set during the peak period (mid-March) took about 80 days to mature, and during the first month of development, stainer population remained below 500 per acre. Over the next 4 weeks,

this figure rose to about 2,500, at which level it remained till mid-June, when the peak of opening had occurred, and then increased, decreasing only in the last week of July and August. The percentage of green bolls that were moderately or heavily stained was 5 in April and the first half of May, and 20 in mid-June.

In general, attack by Jassids was slight, but one field suffered the severest infestation on record, although over a quarter of a mile from the nearest annual cotton, and was attractive because it was planted a fortnight earlier than the others. Infestation by Aphids was negligible.

On the Sabi Tanganda estate [*cf.* **24** 282], records of attack by *Dysdercus* on cotton planted at the end of February were similar to those of 1935. During the development of the crop until about mid-September, infestation remained below 500 per acre, and then increased, *D. fasciatus* predominating. In general, the percentage of heavily stained bolls was not very high ; it was 10–15 in September when the greater portion of the crop matured. Injury by bollworms was negligible. In spite of this, the crop was meagre, probably owing to other factors hitherto masked by stainer damage. During the period May–September, stainers were observed on baobab [*Adansonia digitata*], *Thespesia* and *Sterculia rogersi*.

A. G. Bebbington and W. Allan (pp. 68–71) report from Northern Rhodesia that infestation by *H. armigera* (*obsoleta*, F.) was heavier than in the previous season, but did not cause serious damage to the crops. Egg counts on maize, *Sorghum*, ground-nuts and native beans showed that maize was the most attractive, particularly as it came into tassel. Oviposition on the other crops rarely exceeded that on cotton, but on maize was 4–20 times as great. The records on beans may be impaired by considerable damage done by the Meloid, *Mylabris dicincta*, Bertol. Attack by *Dysdercus* varied from that in other seasons, when the first migrant population of *D. superstitiosus* was attracted to *Hibiscus trionum* in flower in December [**24** 282]. Owing to the late rains, the flowering of this plant was delayed for 17 days and the bulk of the population migrated instead to *H. baumi*, a deep-rooted perennial that was unaffected by the delay. The developmental period of the nymphs is 3 times as long on *H. baumi* as on *H. trionum*, and consequently the F_1 generation did not mature until *H. asper* and *H. cannabinus* were about to flower. Thus there was no break in the food-plant sequence, and the population on cotton was small. Laboratory investigations showed that the length of nymphal development varies greatly on different plants, that a very small proportion of the population survived from June to September, and that no breeding took place during this period. Records of *D. fasciatus* showed that the flowering rate of its food-plant, *Thespesia rogersi*, was much higher than in previous seasons and the attack by Cossids was slight [*cf.* **24** 646]. The consequent plentiful food-supply delayed its appearance on cotton until late May. *D. supersititiosus* was observed on *Triumfetta* sp. during late September, October and early November, where it bred freely, and thus the complete annual food sequence is known [**24** 510]. In the native areas, large plantings were attacked by the cricket, *Brachytrypes membranaceus*, Drury, but early planting might correct this.

W. V. Harris (pp. 109–110) reports from Tanganyika that the incidence of pests on cotton was normal, but the prolonged rains in the east caused some increase. *Platyedra gossypiella*, Saund., which is

still restricted to the eastern zone, increased in the Morogoro district, and the population numbered 14 per hundred locules. It is also of importance in the Rufiji district. *Argyroploce leucotreta*, Meyr., was observed for the first time on cotton in the Territory. *Heliothis armigera* (*obsoleta*) caused severe shedding in some areas. *Dysdercus* spp. were less numerous than usual, and *Nezara* and *Callidea* were scarce, except in the Tabora district, where *Callidea* caused very severe damage. *Helopeltis* was numerous in localised areas where it caused loss of crop, and was associated with the stem-weevil, *Apion xanthostylum*, Wagn. At Shinyanga, considerable damage was done by *Microtermes* sp., less by *Hodotermes*, while in one area, *Amitermes* (*Hamitermes*) sp. was observed cutting stems.

H. C. Ducker, W. L. Miller and S. T. Hoyle (pp. 113–114) state that at Domira Bay, Nyasaland, the first swarm of the red-winged locust [*Nomadacris septemfasciata*, Serv.] was observed on 22nd January, but it did no damage and passed on the following day. A second arrived on 7th February and settled in the half-grown maize, where females oviposited. Hoppers were numerous in patches early in March, but the damage to cotton was slight. Adults were observed in June and were still to be seen in November, then in phase *dissocians*.

Chevalier (A.). **Sur un Coleoptère du genre** *Heteronychus* **causant des dégâts aux bananiers en Guinée française.**—*Rev. Bot. appl.* **17** no. 185 p. 65. Paris, 1937.

Larvae of *Heteroligus* (*Heteronychus*) *claudius*, Klug, have recently been observed in the humus of a banana plantation in French Guinea, where they caused serious damage to the roots of the young bananas. *Raphia humilis*, which occurs in moist soil containing much humus is a common food-plant of this Dynastid, and one of these palms was growing in the vicinity.

Schouteden (H.). **Un nouveau** *Lygus* **du caféier** (*Lygus ghesquièrei* **n. sp.).**—*Rev. Zool. Bot. afr.* **29** no. 2 pp. 213–215. Brussels, February 1937.

Of two Capsids causing injury to coffee in the Kivu area (Belgian Congo), one was identified as *Lygus coffeae*, China [*cf. R.A.E.*, A **24** 106] and the other is here described from both sexes as *Lygus ghesquièrei*, sp. n. Characters distinguishing the two species are given.

Watson (E. B.). **Preliminary Notes on the White Pine Weevil Situation in the Petawawa Forest Reserve, Ontario.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 7–8. Toronto, 1936.

In Ontario, infestation of second-growth white pine [*Pinus strobus*] by *Pissodes strobi*, Peck, appears to develop as a consequence of the removal of the protection afforded by the overstory of Jack pine [*P. banksiana*] or poplar [*cf. R.A.E.*, A **20** 40]. Immunity from attack is probably due to lack of vigour in second-growth white pine. In a dense stand or in one containing a heavy cover crop, the leading shoots are long and slender and not attractive to the weevil, and slow-growing stands in poor soil also appear to be immune. In open plantations, where the leading shoots are strong and vigorous, weevil injury is very severe, and, after repeated attack, the trees develop into multiple-top

worthless shrubs. Experiments are being undertaken, in which various percentages of the Jack pine overstory are being removed, in order to devise methods of regulating cutting operations so as to induce improved growth in the white pine understory combined with immunity from infestation. Investigations are also being carried out to determine which trees will give white pine the most efficient protection in mixed plantations.

DUNN (M. B.). **The Function of Wood-boring Insects in the Development of the Forest.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 8–11. Toronto, 1936.

The author considers that primary wood-boring insect pests of the Canadian forests, when present in moderate numbers, may be of value in maintaining a minor mortality rate among over-mature, weakened or injured trees, and that although the secondary wood-boring insects and bark-beetles that attack dead or dying trees may cause serious loss to the timber industry, their activities within the forest itself, in hastening the processes of decay and the resulting reduction of the wood to humus, are almost entirely beneficial. Infestation of dead conifers by Scolytids, *Sirex* and wood-boring beetles results in the reduction of the bark and wood to a damp pulpy mass, facilitating the growth and development of fungi. Most of these insects confine their attack to recently killed trees and seldom if ever infest the same material twice, but they are followed by various Cerambycids, Buprestids and the Tenebrionid, *Upis ceramboides*, L. *U. ceramboides* breeds in material in almost any state of decay, adults emerging sometimes from beneath the bark of conifers dead for only 2 years, and sometimes from thoroughly rotten wood. In one experiment several generations were completed on rotten logs of birch, each brood of adults ovipositing upon the material from which it had emerged. Red and white pine [*Pinus resinosa* and *P. strobus*] with exceedingly resistant heartwood will be found to contain beetle larvae 20 years after the tree has fallen, and several years after the death of spruce the roots may be infested with the larvae of the Buprestid, *Chalcophora virginiensis*, Leng. Deciduous trees are more resistant to wood-boring insects for a year or so after death than are most conifers, but once reduction has begun it proceeds very rapidly. Larvae of a few Tenebrionids, Lamellicorns and Elaterids and a very few Longicorns are associated with fungi in the final process of dissolution, and, a few years after these have emerged as adults, the material in which they developed has become part of the forest floor.

VAN STEENBURGH (W. E.). **Notable Changes in the Oriental Fruit Moth Parasite Situation.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 15–16. Toronto, 1936.

An account is given of the relative importance of *Macrocentrus ancylivorus*, Rohw., and *Glypta rufiscutellaris*, Cress., as parasites of the oriental fruit moth [*Cydia molesta*, Busck] in peach orchards in Ontario [*cf. R.A.E.*, A **24** 146]. From 1932 to 1935, the percentage parasitism of the second generation by *Glypta* declined from 63·6 to 3·2, while that by *Macrocentrus* increased from 10·8 to 74·4, and from 8·5 to 30·8 of the first generation. As *Glypta* never parasitised more than 0·5 per cent. of the first generation, it is now of no practical

importance. Liberations of *Macrocentrus* are being continued in the west of the Niagara Peninsula, and the percentage of second generation larvae parasitised there is almost as high as in the districts where it was first established.

ARMSTRONG (T.). **Two Parasites of the White Apple Leafhopper (*Typhlocyba pomaria* McA.).**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 16–31, 3 pls., 2 figs., 6 refs. Toronto, 1936.

From 1933 to 1935, investigations were carried out on the bionomics of a Mymarid, *Anagrus armatus* var. *nigriventris*, Gir., and a Dryinid of the genus *Aphelopus*, allied to *A. microleucus*, Perkins, both parasitising *Typhlocyba pomaria*, McAtee, on apple in Ontario [*R.A.E.*, A **24** 64]. Emergence of the adults of *Anagrus* from the overwintered eggs of the Jassid began at the end of May or the beginning of June and continued till the end of July. The next generation emerged from the summer eggs from about mid-July to mid-August. Adults that emerged in smaller numbers in September and October may possibly represent a third generation [*cf.* **22** 656]. In 1935, the number of parasites declined very considerably as the season progressed, although the host eggs were plentiful. When the summer eggs were parasitised, the leaf tissue immediately surrounding the parasite exit-hole died and collapsed, but the tissue was not affected when the eggs hatched normally. In 199 leaves examined, 40·4 per cent. of the Jassid eggs were parasitised, and 1,121 parasite exit holes were present, the maximum number of the latter in any one leaf being 31, with an average of 6. Parasitism of the overwintered eggs was as high as 74·8 per cent. in one batch of 186 eggs, but lower than this in rearing experiments, when it varied from 13·5 to 52·8 per cent. in samples of infested twigs containing altogether 542 eggs. Of a total of 281 adults examined, 70·1 per cent. were females; none of the adults lived for more than 24 hours under laboratory conditions.

The bionomics of the species of *Aphelopus* are very similar to those of *A. typhlocybae*, Mues., parasitising the same host in New York [**24** 734]. In the summer, the average time elapsing from larval maturity to emergence of the adult was 42 days. The highest degree of parasitism recorded was 36 per cent., in a batch of 250 Jassids in June 1934. Various ways in which the mature larvae were kept to complete the cocoon stages in rearing experiments are enumerated; none died when they were in glass tubes sunk in soil. Cultivation of the soil beneath the apple trees greatly reduced the numbers pupating.

BRIAND (L. J.). **Shipping of Potato Beetle Parasites and Predators to France, with Notes on the Species involved.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 31–34. Toronto, 1936.

Natural enemies of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] collected in New York State in 1928 and 1933 and introduced into France [*cf. R.A.E.*, A **22** 434, etc.] included the Tachinid, *Doryphorophaga doryphorae*, Riley, the Carabid, *Lebia grandis*, Hentz, and the Pentatomids, *Perilloides* (*Perillus*) *bioculatus*, F., and *Podisus maculiventris*, Say. For various reasons, however, sufficient material was not obtained for satisfactory establishment, particularly of the Tachinid, and collections were therefore made in Ontario in August and September 1935, when *Perilloides bioculatus*,

P. (*Perillus*) *circumcinctus*, Stål, and larvae of *L. decemlineata* parasitised by *D. doryphorae* were obtained. The Tachinid deposits its eggs in the larvae, in which they hatch almost immediately. As the parasites develop, the host larvae become soft and sluggish, their skins turning black by the time the parasites are full-grown. Parasitised larvae are thus easily distinguishable. The parasites then occupy the whole body cavity of the larvae and pupate within them. The percentage of parasitism in 47 fields averaged 60·6 ; it was 40 in the same year in another part of Ontario, 13–50 in Manitoba, and 17 in New Brunswick.

Larvae of *L. decemlineata* collected by shaking infested potato plants over pails were placed in cages with a layer of slightly moist sand at the bottom, and fed on potato tops for 5 or 6 days. At the end of that time most of them went into the sand to pupate, or die if parasitised ; 7 or 8 days later they were sifted out and those parasitised were placed in a refrigerator until shipping time. They were then placed between layers of moist sterilised sphagnum moss and packed in lots of 100 in " flat fifty " cigarette tins, the tins in their turn being packed in excelsior in a wooden box. Larvae containing puparia were packed in moss under coarse wire screening in the bottom of cigar boxes covered with fine wire screening and containing lumps of sugar as food for the emerging flies. The two species of *Perilloides* were both fairly abundant, *P. circumcinctus* being the more numerous. As these Pentatomids attack each other when crowded, they were packed in screen boxes divided into small compartments each containing 3–5 with a sufficient number of the beetle larvae for food. Altogether 15,000 parasitised larvae and 1,500 bugs were sent in 7 different shipments to France. With the exception of 2 small lots sent by mail, the material was shipped to Bordeaux by express and kept in cold storage on the boats and, in spite of delays of several days, all arrived in excellent condition.

PATTERSON (N. A.). **Mealy Bug Control in Nova Scotia.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 34–36, 1 ref. Toronto, 1936.

Phenaccocus aceris, Sign., has recently become a pest in the apple orchards of Nova Scotia [*R.A.E.*, A **23** 680 ; **24** 614]. Conditions favouring outbreaks are close planting, thick tree tops such as occur in lightly pruned orchards, and dense succulent foliage resulting from the liberal use of fertilisers. Studies have shown that there are two vulnerable periods in the life-history [*loc. cit.*], the first in the second half of April, by which time the female nymphs have emerged from the cocoons in which they hibernated and have moved to the fruit spurs and small twigs, and the second after the eggs hatch in July and early August. The newly hatched nymphs remain clustered under the fibrous material covering the egg mass, which has then become rather open and is readily penetrated by sprays. Dormant sprays applied about the middle of April gave excellent control, the best being obtained with a 5 per cent. tar distillate. A 3 per cent. lubricating oil spray also gave almost complete control. Lime-sulphur (1 : 7) was less satisfactory. In the delayed dormant period, by which time the insects had a considerable covering of wax, the oil spray did not give very good results, and nicotine sulphate, lime-sulphur and derris were practically ineffective. Summer sprays of nicotine sulphate, applied during the last week of July at rates of 1 : 400 and

1 : 800, gave an average control of 90 and 85 per cent., respectively. Wetting agents gave slightly increased toxicity, especially in the case of the weaker spray, which was also improved by the addition of a few pounds of hydrated lime. Free nicotine was almost as effective as nicotine sulphate. Nicotine sprays applied after the middle of August were not so satisfactory. Summer oil was a little less effective than the nicotine. Lime-sulphur (1 : 60) gave some control, but is apt to injure the leaves. Sprays of pyrethrum, derris and Selocide (30 per cent. potassium-ammonium-seleno-sulphide) [*cf.* **21** 565, etc.], which was used at a concentration of 1 : 400, were all ineffective. In applying the summer sprays, particular care should be taken to cover the lower surface of the leaves and the branches where egg masses occur.

Beaulne (J. I.). **The Insect Fauna of the Raspberry Plantations of the Province of Quebec.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 36–37. Toronto, 1936.

As a result of a survey of the raspberry plantations of Quebec, a list is given of 17 species of insects infesting them, arranged in order of importance, with notes showing the parts of the plant they attack.

Caesar (L.). **The European Corn Borer in Ontario in 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 38–39. Toronto, 1936.

Figures for various counties are given showing that, as compared with 1934 [*cf. R.A.E.*, A **24** 149], infestation of maize by *Pyrausta nubilalis*, Hb., increased greatly in Ontario in 1935. Fluctuations in the population from year to year are thought to be due, not to variations in the action of natural enemies and diseases or of the control methods employed, but to the weather in June and July.

Hudson (H. F.) & Wood (A. A.). **An interesting June Beetle Habitat in Ontario.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 39–42, 1 fig. Toronto, 1936.

In June 1935, five collections of adults of *Lachnosterna* (*Phyllophaga*) were made by beating some of the trees and shrubs in an area of 5·3 acres in southern Ontario, not far from the State of Michigan, and a sixth by means of a light trap about 1½ miles south of this area. Altogether 9 species were taken, which is remarkable as only 18 have been recorded in the whole of Ontario and 22 in Canada. The ground was 600 feet above sea level. A few tall trees, none more than 35 feet high, occurred in isolated groups of 2 or 3. The greater part of the habitat was comprised of grassy areas interspersed with clumps of various shrubs. A list is given of the plants found, including most of the grasses. Further lists show the species of *Lachnosterna* taken and those that have been recorded in Ontario and in Michigan.

Hammond (G. H.). **White Grub Surveys in Ontario during 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 42–45, 2 figs. Toronto, 1936.

Studies of *Lachnosterna* (*Phyllophaga*) spp. in eastern Canada have shown that larvae of *L. anxia*, Lec., occur in 3 distinct zones in Quebec, in each of which they are in a different year of development [*cf. R.A.E.*, A **22** 568, etc.]. The zone that occupies the upper Ottawa valley proved to be identical with a zone in eastern Ontario, and

information available in 1932 made it possible to forecast the periods of beetle flight over the greater part of eastern Ontario from 1933 to 1936, but the distribution of the larvae in central and western Ontario was not so well known. A survey of this area was accordingly carried out in 1935, when a major flight of the beetles was expected to be in progress. Most of the adults were collected from their host trees at night. The most injurious species in order of importance were *L. anxia*, *L. futilis*, Lec., and *L. fusca*, Fröl. ; the first was the most widespread and injurious, the second, although restricted in its distribution, was very common where it occurred, and the third was widely distributed, but less abundant than either of the others. Areas where second-year larvae occurred were found as distinct life-history zones in several localities, and damage by them to strawberries, hay and nursery crops was more severe than it had been for many years. The adults caused serious injury to elm, oak, rose, willow, and numerous other host trees.

GAUTHIER (G.). **Observations concerning the White Grubs in Quebec, in 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 45–48. Toronto, 1936.

Damage by white grubs [*Lachnosterna* spp.] to pasture, cereals and vegetable crops in Quebec in 1935 was very serious, causing a loss of nearly £2,000 on 45 farms surveyed, on which a total area of 1,183 acres was devastated. The chief factors that contribute to severe infestation in Quebec are the prevalence of light and gravelly soils favourable to larval development, the fact that the larger part of many farms is cultivated only once in 8–10 years, and the occurrence of a noxious weed, *Spiraea tomentosa*, in the permanent pastures. This weed is not easily trampled down by cattle, and the beetles oviposit in the loose soil under it. The permanent pastures thus become sources of infestation for the neighbouring prairies and cultivated fields. In severely infested prairies, from 400,000 to 500,000 larvae per acre were found. If 10 larvae per square foot is taken as the average, their weight represents a total of 890 lb. per acre. As it has been estimated that 2–3 acres of pasture land will nourish an animal weighing 700–900 lb. during the summer, it is probable that even 1–2 larvae per square foot will cause severe damage to numerous crops.

Recommendations for control include the adoption of a crop rotation in which leguminous plants [*cf.* **21** 515] will be grown in years of major flight. *Spiraea tomentosa* should be eradicated from permanent pastures. In flight years, there should be frequent fallowing and disking of fields that are to grow hoed crops the following year. In prairies severely infested by second-year larvae, semi-fallowing should be carried out ; in experiments, 91 per cent. of the larvae were thus destroyed. Pigs kept in limited areas by movable fences are very effective in eradicating the larvae.

CAESAR (L.) **Notes on a new or hitherto unrecorded Pest of Sweet Clover in Ontario.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 54–56. Toronto, 1936.

Adults of *Sitona cylindricollis*, Fhs., which was first recorded in the United States in 1932 [*cf. R.A.E.*, A **22** 256], were found in August

and September 1935 in two counties in Ontario, where they caused severe damage to the leaves and stems of sweet clover [*Melilotus*]. Alsike clover [*Trifolium hybridum*] was attacked less severely; the weevils appeared not to feed on lucerne [but *cf.* **24** 747] or red clover, although they occurred on both. Feeding continued into October, but after the middle of that month the adults were found hibernating beneath almost any kind of shelter on the ground, and in cracks and crevices of the fence posts and rails. In fields of sweet clover, there were from 25 to 100 or more weevils per square yard. No stage other than the adult was found, and dissected females did not contain any mature or almost mature eggs.

GORHAM (R. P.). **The Bronze Cutworm, *Nephelodes emmedonia* Cram. in the Maritime Provinces.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 56–58. Toronto, 1936.

Outbreaks of *Nephelodes emmedonia*, Cram. [*cf. R.A.E.*, A **15** 185] appear to recur in marshlands in Nova Scotia and New Brunswick at intervals of 5 or 6 years. Since 1922, yearly examinations of the marshlands have been undertaken to determine the abundance of the larvae. Indications of the development of another outbreak were observed in 1934, and about 2,000 acres of grass were completely destroyed in June 1935, while an equal area was attacked less severely. The usual parasites and diseases of this Noctuid were almost wholly absent; in the infested areas there were, on an average, 40 pupae per square yard, and a high percentage of the moths emerged. In September and October, soil samples were taken from 83 localities, and the average number of eggs per square foot was 32. More than 60 per cent. of the eggs had hatched by mid-October, and, as the weather was mild, many of the larvae were in the second instar at the beginning of November. As these observations indicated the probability of an extensive outbreak in June 1936, circulars were sent to more than 1,000 owners of marshland advising the ploughing of old meadows likely to be severely infested, and the cleaning out of drainage ditches.

MITCHENER (A. V.). **The Grasshopper Campaign in Manitoba in 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 58–60, 1 fig. Toronto, 1936.

In 1935, an outbreak of grasshoppers occurred for the fifth consecutive year in Manitoba [*R.A.E.*, A **24** 149], the two most abundant species being *Camnula pellucida*, Scudd., which was the most injurious, and *Melanoplus bivittatus*, Say. The infestation was much less severe than in 1934, and it is thought that this was partly due to less favourable weather conditions in the early summer. During late June and early July, enormous numbers of *C. pellucida* were destroyed by a fungus believed to be *Empusa grylli*; *M. bivittatus* was much less affected. Hatching was first reported on 15th May. Poisoning was begun on 23rd May in one locality, but was not general until 15th June, and ceased about 17th July. The bait contained an increased proportion of sawdust, at least 3 parts to 1 of bran or malt sprouts, and 1 quart liquid sodium arsenite (containing 2 lb. As_2O_3) to 100 lb. dry carrier. Approximately 1,710 tons of wet bait were used by 3,222 farmers, and it is estimated that 400,000 bushels of wheat, 425,000 bushels of oats, and 350,000 bushels of barley were saved.

GILBERT (H. A.). **A Note on Grasshopper Outbreaks in the Counties of Renfrew and Hastings, Ontario, in 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 60–62, 1 fig. Toronto, 1936.

In July 1935, severe damage by grasshoppers to cereal and vegetable crops was reported from an area 100 miles due west of Ottawa and about 120 square miles in extent. The agricultural land is there cleared from bush, and the country is sandy and very rough. The four species concerned were *Camnula pellucida*, Scudd., *Melanoplus angustipennis*, Dodge, *M. bivittatus*, Say, and *Dissosteira carolina*, L.; the first two were the most injurious, as the others restricted most of their feeding to headlands and roadsides. The grasshoppers attacked the grain crops as soon as the hay had been cut, and the leaves of all the cereals were eaten down to the ground. Poison baits consisting of 25 lb. bran, $1\frac{1}{4}$ lb. Paris green, 1 lb. salt and about 5 gals. water, with or without the addition of 1 pint molasses, were applied in the grain fields, and the numbers of grasshoppers decreased noticeably, although in actual counts there were only 6–7 dead ones per square yard. In a survey in early September, only 3 definite egg beds were found, although individual pods frequently occurred in pastures, headlands and roadsides. In the largest egg bed, along the headland of a hayfield, there was an average of 1,278 eggs per square foot, but in the smaller ones only 77–275.

A minor outbreak of grasshoppers was also reported from a sandy area about 25 miles north of Belleville. Here the predominant species were *Melanoplus mexicanus mexicanus*, Sauss., and *C. pellucida*. No egg pods were found in this locality, although an extensive search was carried out.

MONRO (H. A. U.). **Notes on Insects found infesting Packing Materials entering the Port of Montreal.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 63–66, 5 refs. Toronto, 1936.

Owing to the rapid spread of Dutch elm disease, caused by *Ceratostomella ulmi*, in Europe and its discovery in some parts of the United States, periodical examinations of boxes and containers of undressed wood entering the port of Montreal were made in 1934 in order to determine whether wood-boring insects likely to be vectors of plant diseases or injurious in themselves were present. Elms, elm logs and burls are prohibited entry into Canada, but there is a possibility of undressed elm wood being brought in accidentally when it is used as part of wooden containers or packing material, and it was intercepted twice. During the year about 38,000 crates and barrels entered the port, the majority coming from the pottery district of the English midlands. Among these were hoops of willow infested with *Gracilia minuta*, F., and in 74 crates examined, 56 contained ash and 34 of these were infested with *Hylesinus* (*Leperisinus*) *fraxini*, Panz. So far as is known, neither of these beetles is as yet established in Canada.

STIRRETT (G. M.). **The Walnut Husk Fly, *Rhagoletis suavis* Loew, in Ontario.**—*Rep. ent. Soc. Ont.* **66** (1935) p. 69, 3 refs. Toronto, 1936.

Rhagoletis suavis, Lw., is widely distributed throughout south-western Ontario, where it infests the native black walnuts (*Juglans*

nigra). Ripe walnuts of this species may contain as many as 30 larvae when shaken from the trees in October, but they suffer little, if any, damage from them. One grower states, however, that he has seen the larvae in husks of Japanese walnuts [*J. sieboldiana*] and that they destroyed his whole crop of Japanese walnuts about 1925. In October 1933, infested husks were collected and kept under laboratory conditions. The larvae pupated in soil in the cages, and most of the puparia produced adults in the following July, but a few did not do so until July 1935 [*cf. R.A.E.*, A **23** 417].

Division of Entomology.—*Rep. N. Y. St. agric. Exp. Sta.* **55** (1935–36) pp. 48–62. Geneva, N. Y., 1937.

Much of the work here reported against insect pests in New York has already been noticed [*R.A.E.*, A **24** 428, 431, 723, 725, 726, 734 ; **25** 14, 91, 235]. During 1935, the second brood of the codling moth [*Cydia pomonella*, L.] was small owing to the cool and rainy weather, and control was comparatively easy. More than 2 cover sprays containing 1 per cent. summer oil are not recommended, as the oil interferes with the colouring of some apples, and, when used in combination with lead arsenate, complicates the removal of residue. A spray of oil and nicotine gave the most promising results for the control of *C. pomonella* on pear [*cf.* **24** 277]. As in previous years [**23** 315], injury was much less in areas in which light-traps were used. *Ascogaster carpocapsae*, Vier., is the most common larval parasite in western New York. It is less abundant in sprayed than unsprayed orchards. The Membracid, *Glossonotus crataegi*, Fitch, appeared in several apple orchards in north-western New York. Nicotine sprays [*cf.* **22** 401] at petal fall were the most successful control measure.

Sprays of illuminating-gas tar oil (distillation range 200–360°C.) applied to fruit trees during the dormant stage, controlled the black cherry aphis [*Myzus cerasi*, F.] at a concentration of 1·8 per cent., the rosy apple aphis [*Anuraphis roseus*, Baker] at 2·5 per cent., *Psylla* (*Psyllia*) *pyricola*, Först. (pear psylla) at 3 per cent., and *Lepidosaphes ulmi*, L., *Chionaspis furfura*, Fitch, and the eye-spotted bud moth [*Eucosma ocellana*, Schiff.] at 4·5–5·5 per cent., but did not effectively reduce the numbers of the San José scale [*Aonidiella perniciosa*, Comst.], the fruit-tree leaf roller [*Tortrix argyrospila*, Wlk.] or *Paratetranychus pilosus*, C. & F. Sprays containing 2·5 per cent. illuminating-gas tar oil and 3 per cent. lubricating oil were effective against Aphids, *A. perniciosa*, *P. pilosus* and light infestations of *E. ocellana*. Water-gas tar oil (with the same distillation range) at 3 per cent. was as effective as illuminating-gas tar oil against *M. cerasi*, *Anuraphis roseus*, and *Psylla pyricola* but was less so against *E. ocellana* and *L. ulmi*. Lubricating oil emulsion with 3 per cent. oil continued to control *Aonidiella perniciosa*, *P. pyricola* and *Paratetranychus pilosus* and can be applied to apple at the dormant or green tip stage ; at 6 per cent., it controlled *T. argyrospila* and was fairly effective against *C. furfura*, but can only be applied to dormant trees. A green-tip application containing nicotine (1 : 800 or 1 : 400) and 3 per cent. oil was very effective against *E. ocellana*, but a mixture in which 0·5 per cent. cresylic acid was substituted for the nicotine was not. Both were erratic in their control of *Anuraphis roseus*, the mixture containing nicotine giving very poor control of the Aphid

in 1936. An emulsion containing 75 per cent. oil and 3 per cent. dinitro-o-cyclohexylphenol gave good control of *P. pilosus*, *Psylla pyricola*, *A. roseus*, *M. cerasi*, *Aonidiella perniciosa*, and *E. ocellana*, when used in a spray containing 2 per cent. oil, and slightly better when there was 3 per cent. Concentrations of 4–6 per cent. gave very high control of *L. ulmi*, and 3 per cent. a moderate control. When this material had been properly emulsified, no ill effects from it were observed on the trees.

Cuprous cyanide, zinc arsenite and basic zinc arsenate gave excellent control of *Rhagoletis pomonella*, Walsh, on apple in 1935, but the first two caused considerable foliage injury. Sprays containing different forms of nicotine, applied several times during adult emergence, gave essentially negative results. As it had been shown that *Tachypterellus quadrigibbus*, Say, hibernates directly under apple trees and that adults can be killed by spraying the sod with kerosene emulsion [**22** 181, 401], the sod under the trees in two whole orchards was treated experimentally in 1935 with 25 per cent. kerosene emulsion. Infestation in them was reduced by 79·1 and 90·8 per cent., respectively, compared with that in the previous year. Tar oil emulsion containing at least 3·5 per cent. actual oil was effective against *C. furfura*, serious outbreaks of which occurred on apple in an area of south-eastern New York. Petroleum oil (65 per cent. unsulphonatable residue and viscosity 100 secs. Saybolt) only gave a satisfactory kill when used at 6 per cent. or over, and lime-sulphur (1 : 8) was unsuccessful. Of the sprays tested against *Typhlocyba pomaria*, McAtee, on apple, nicotine sulphate and a slightly alkaline soap, each used at 1 : 1,600, was the most satisfactory. Experiments indicated that *Graptolitha laticinerea*, Grote, on pear could be controlled with lead arsenate applied at the end of blossoming. A combination spray for the control of *G. laticinerea* and *Psylla pyricola* applied 10 days after petal fall gave little control of the former. Naphthalene and acid phosphate applied to the soil under pear trees in April proved ineffective against *Contarinia pyrivora*, Ril. During the past 3 years, some 119 colonies, comprising 11 species, of parasites imported from Europe, Japan and Australia have been liberated to supplement the work of *Macrocentrus ancylivorus*, Rohw. [**24** 543] in the control of the oriental fruit moth [*Cydia molesta*, Busck] on peach, and recoveries of 5 species were made. Probably parasites, as well as the absence of fruit in 1934, were responsible for the scarcity of the pest in western New York in 1935, where the average percentage of fruit infested in 4 counties on the south shore of Lake Ontario was only 6·42. A solution of 2 lb. paradichlorobenzene dissolved in 1 U.S. gal. crude cottonseed oil (unemulsified) painted on injured parts of peach trees gave about 75 per cent. kill of the larvae of the lesser peach borer [*Aegeria pictipes*, G. & R.], and dipping nursery trees in oil and paradichlorobenzene (1–4 oz. in 1 U.S. gal. mixture) controlled *A.* (*Conopia*) *exitiosa*, Say.

Adults of *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., which attacked hemlock [*Tsuga*] and several varieties of arbor-vitae [*Thuja*], were controlled by poison baits of bran and molasses [*cf.* **24** 278]. Oil was slightly less effective than molasses. *O.* (*B.*) *sulcatus*, F., on *Taxus* and strawberries was readily killed with both baits when sodium fluosilicate was used as the toxic agent. *Lepidosaphes ulmi* on lilac was not so susceptible to lime-sulphur (1 : 8), dormant applications of lubricating oil, or tar washes as the form that occurs on apple.

Trouble has been caused in some nurseries by *Argyroploce* (*Olethreutes*) *abietana*, Fern., and *Recurvaria piceaella*, Kearf., on spruce, *Phalonia rutilana*, Hb., on *Juniperus*, and a Coccid, thought to be *Lecanium fletcheri*, Ckll., on *Taxus*, *Juniperus* and *Thuja*. Tar distillates and other dormant sprays proved effective against eggs of *Chioaspis pinifoliae*, Fitch, on pines, but all except tar distillates were toxic to the trees at the dilutions employed.

Field tests showed that derris and cubé or timbo root [*Lonchocarpus*] were practically equal in their effect on the imported cabbage worm [*Pieris rapae*, L.]. Sprays containing 4 lb. good grade powdered root in 100 U.S. gals. water with an adhesive gave fair results, but were inferior to dusts, which gave excellent control with 0·5 per cent. rotenone content and satisfactory control with 0·33 per cent. Such dusts applied in July in late evening to a cauliflower seed-bed effectively controlled thrips and Aphids. Derris was slightly superior to cubé or timbo for the control of *Epilachna varivestis*, Muls. (*corrupta*, Muls.) on beans. Sprays containing 2–3 lb. root to 100 U.S. gals. water with an adhesive gave satisfactory results and were more beneficial to plant growth than dusts, of which the best were those with 0·5 and 0·75 per cent. rotenone content.

Sweet maize planted in the latter part of May matures in early August when the population of *Heliothis armigera*, Hb. (*obsoleta*, F.) is low, and in the case of a single planting, severe injury might be avoided by careful timing. A less expensive type of moth-proof enclosure than the one already noticed [**24** 429] was tobacco cloth placed over the plants and fastened to the ground without erect supports at the time when the plants were most attractive for oviposition. This controlled *H. armigera*, but not the European corn borer [*Pyrausta nubilalis*, Hb.], on account of the short period during which the plants were covered. Electrocuting light-traps provided valuable data on *H. armigera*, but did not effect any practical reduction in the infestation.

Haseman (L.). **Controlling Borers of Fruit, Forest, and Shade Trees.**—*Bull. Mo. agric. Exp. Sta.* no. 373, 24 pp., 13 figs. Columbia, Mo., December 1936.

Notes are given on the bionomics and control of the principal borers infesting fruit, forest and shade trees in Missouri ; owing to the exceptional heat and drought of the years 1934–36 and a reduced rainfall for several years previously, they have recently caused considerable damage. Those attacking fruit trees are *Chrysobothris femorata*, Ol., and *Saperda candida*, F., on apple, *Aegeria* (*Conopia*) *exitiosa*, Say, and *A.* (*C.*) *pictipes*, G. & R., on peach, and *Scolytus rugulosus*, Ratz., on a variety of fruit trees.

Felt (E. P.) & Bromley (S. W.). **Scientific Contributions.**—*Bull. Bartlett Tree Res. Labs* no. 2, 24 pp., 10 figs., many refs. Stamford, Conn., 1937.

These contributions comprise a paper entitled Balloons as Indicators of Insect Drift and of Dutch Elm Disease Spread, by Felt, which occupies 10 pages, and a series of notes on other pests of forest and shade trees in the north-eastern United States, by Felt and Bromley in collaboration.

The sporadic outbreaks of various insect pests and of Dutch elm disease [caused by *Ceratostomella ulmi*] in New England and northern New York suggested that wind drift played an important part in their dissemination [*cf. R.A.E.*, A **23** 328], and toy balloons, inflated with hydrogen for minimum buoyancy, were used to investigate the wind currents in an area of which New York City was the approximate centre. Of 4,935 balloons released from different centres between 9th May and 23rd July 1936, 208 were found at distances varying from 3 to 183 miles. The distribution of Dutch elm disease in Connecticut suggests that it is disseminated for distances of at least 14–20 miles, and that it has spread in directions similar to those followed by the balloons. It is thought that the wind drift for both balloons and insects should be about the same, so long as both remain in the air, and the possibility of the vector, *Scolytus multistriatus*, Marsh., being too heavy an insect for protracted flight or drift is not supported by the available facts. Ten different species of bark-beetles, most of them larger and heavier than *S. multistriatus*, and thousands of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say.] have been taken on a building in Albany at a height of 125 feet above the ground, the conditions being such that they must have flown or drifted for a mile or more. Bark-beetles and ambrosia beetles have also been taken in aeroplanes in Louisiana at altitudes varying from 200 to 2,000 feet.

Observations in 1934 on *Alsophila pometaria*, Harr., infesting woodland trees in New England, showed that egg-masses in the open hatched in May, but those brought into the laboratories early in January or February began to hatch about 4 weeks after they had been exposed to normal room temperatures and humidities [*cf.* **24** 776]. From 20 to 30 per cent. of these eggs hatched after being sprayed with miscible oil, 1 : 16. Laboratory and field observations on egg-masses that had been sprayed with lead arsenate showed that many of the larvae are killed when they attempt to eat their way out of the eggs. In 1935, almost complete mortality of nearly mature larvae was obtained in experiments with proprietary pyrethrum sprays. Where, in one case, rings of bark, 3–5 inches wide and $\frac{3}{8}$ inch deep, were stripped from 13 elm and lime trees and banding adhesive was applied directly to the girdled area, the trees all died within 7 years. A number of elms have been recently so treated, and it is probable that all will die within a few years unless the injury is offset by bridge grafting.

In some places, the early buds of black walnut [*Juglans nigra*] and ash were practically destroyed by the larvae, and the trees remained bare for an abnormally long time. The larvae spin long strands of silk as they drop from the leaves, and drift on the wind. Infestations tend to shift from one area to another, sometimes over a distance of several miles and in the direction of the prevailing winds [*cf.* **24** 15]. Predators included birds and the Carabid beetles, *Calosoma frigidum*, Kby., *C. wilcoxi*, Lec., and *C. scrutator*, F. The adults of *Hister immunis*, Er., which was also abundant, are thought to feed on eggs of *Calosoma*, and one was seen killing a partly grown *Calosoma* larva. The Tachinid, *Pseudotachinomyia webberi*, Smith, was quite common in areas where there were many *Alsophila* larvae.

Since 1932, observations have been made in Connecticut on damage to pines by *Cecidomyia* (*Itonida*) *pinifoliae*, Felt, which was described in 1936 (*J. N.Y. ent. Soc.* **44** pp. 7–8), but is very similar to, and possibly identical with, the European species, *Thecodiplosis* (*Cecidomyia*) *brachyntera*, Schwäg. The larvae occur at the base of the needle

bundles of white pine [*Pinus strobus*] and Scots pine [*P. sylvestris*]; the needles become discoloured and drop during the summer. Infestation tends to move up the tree as the new foliage develops, and may sometimes affect 75-95 per cent. of the needle bundles. When infested bundles were collected at the end of June 1934 and kept on earth in flower-pots outdoors, the adults emerged from 28th May to 11th June in the following year. On 25th June, larvae were found at the base of needle bundles, although there were no external signs of attack, and many of them were full-grown by 5th July. After this, the infested bundles dropped rapidly. Several parasites were reared but have not yet been identified. Another Cecidomyiid, *Dasyneura ulmea*, Felt, was found infesting the buds of elm sprouts 6–7 feet high in Connecticut. Attack seems greatly to reduce internodal growth, so that the dead buds are clustered together. Observations in 1936 suggested that the adults appeared in June.

Different types of injury to the leaves of elms caused by the feeding of adults of *Eutetrapha* (*Saperda*) *tridentata*, Ol., *Magdalis armicollis*, Say, and *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh., are briefly described.

In 1926, *Hylobius radicis*, Buchanan, caused severe damage to *Pinus sylvestris* in a 15-year-old plantation in New York. This weevil has also been recorded from Connecticut and Minnesota, attack being usually confined to trees in sandy areas. Those most severely infested showed a characteristic yellowish discoloration and died off rapidly in the early summer. At the base of the trees, there were considerable masses of pitch-infiltrated soil, and in the inner bark and cambium there were cells containing larvae. Adults reared from these included *Hylobius pales*, Boh., as well as *H. radicis*, the two species often having been confused, and also *Pissodes approximatus*, Hopk. [**21** 244]. In northern New York, damage to *P. sylvestris* appears to be due mainly to another weevil, *Hylobius* (*Hypomolyx*) *piceus*, DeG., which also attacks red pine [*P. resinosa*], pitch pine [*P. rigida*] and occasionally *P. strobus*. Pupation occurs during late June and July, and the weevils emerge from their pupal cells in late August. They live for about 15 months and oviposit in the soil close to the trees, sometimes continuously from May to September. Recommendations for control include the elimination of pine stumps and logs near young pine trees, particularly *P. sylvestris*.

A small holly tree in Delaware was severely infested by a probably undescribed species of *Asterolecanium*. The bark of the infested branches was pitted and swollen. *Phyllocoptes quadripedes*, Shim., infesting maple, was found to leave the foliage in late summer and congregate in masses on the bark, apparently taking refuge in cracks and crevices. Other pests on which notes are given include *Eucosma gloriola*, Heinr., on *Pinus strobus* [**22** 285], *Nepticula sericopeza*, Zell., on Norway maple [*Acer platanoides*] [**19** 206], and *Xyleborus germanus*, Bldf., infesting the stems of grape-vines in a greenhouse [**20** 430].

KEIFER (H. H.). **California Microlepidoptera VIII.**—*Bull. S. Calif. Acad. Sci.* **35** pt. 1 pp. 9–29, 4 pls. Los Angeles, Calif., 1936.

New species described in this paper include *Eucordylea huntella*, infesting the flower-buds of a wild azalea, and *Gelechia langei*, reared from *Pinus ponderosa*.

A Bibliography of Nicotine. Busbey (R. L.) & McIndoo (N. E.). **Part I. Chemistry of Nicotine.**—*E 384*, 257 pp. McIndoo (N. E.), Roark (R. C.) & Busbey (Mrs. R. L.). **Part II. The Insecticidal Uses of Nicotine and Tobacco.**—*E 392*, 628 pp. [Washington, D.C.] U.S. Dep. Agric., Bur. Ent. 1936.

The titles of 851 papers or monographs, followed by very brief abstracts of their contents, are given in the first part of this bibliography, and 2,497 are similarly treated in the second.

Wagner (G. B.), Cotton (R. T.) & Young (H. D.). **The Machinery-piping System of Flour-mill Fumigation.**—*E 396*, 8 pp. multigraph, 8 pls. [Washington, D.C.] U.S. Dep. Agric. Bur. Ent., October 1936. [Recd. March 1937.]

An account is given of the method of fumigating flour mills by introducing hydrocyanic acid gas directly into the machinery through a system of copper tubing and spray nozzles [*cf. R.A.E.*, A **24** 719], which is cheaper than fumigating the open space of the mill by the pot method or with liquid hydrocyanic acid. There is little difference in the relative effectiveness of the three methods, which are compared [*cf. loc. cit.*], and one experiment indicated that by the new method exposures of 4 hours were as effective as those of 8 hours, owing to the high gas concentration obtained. The arrangement of a typical system is shown, with details of the piping of individual machines, and directions are given for the preparation of the mill for fumigation and for the application of the gas.

Edwards (W. H.). **Report of the Government Entomologist.**—*Rep. Dep. Sci. Agric. Jamaica 1935* pp. 76–80, 1 graph. Kingston, 1936.

In 1935, the gladiolus thrips, *Taeniothrips simplex*, Morison (*gladioli*, Mlt. & Stnw.) was found in Jamaica for the first time. Bananas were again blown down by high winds, and infestation by *Cosmopolites* [*sordidus*, Germ.] increased [*cf. R.A.E.*, A **24** 381]. The toad, *Bufo marinus*, though introduced into Jamaica more than 60 years ago, has not yet spread into certain valleys. It feeds voraciously on adults of *Cosmopolites*, and measures are being taken to increase its distribution. Seedling bananas in greenhouses were occasionally attacked by the Aphid, *Pentalonia nigronervosa*, Coq., and *Tetranychus* sp. Measures previously recommended for the control of *Coccus viridis*, Green, on coffee [*loc. cit.*] were very successful, but, where they were not adopted, it caused considerable damage during the months when the entomophagous fungus, *Cephalosporium lecanii*, was not abundant. It was also the only Coccid at all prevalent on *Citrus*. Trapping experiments for two years have shown that the mango fruit-fly, *Anastrepha longimacula*, Greene, is most numerous from July to September, during the Bombay mango season, and that, owing to the presence of other host-fruits such as guava and wild mangos, it can be found throughout the year.

Occasional outbreaks of *Saccharosydne* (*Delphax*) *saccharivora*, Westw., and *Chlorotettix* sp. occurred on sugar-cane during the autumn, but were of short duration. Of the varieties of cane grown under experimental conditions, CO 213 showed the highest percentage

(22·6) of nodal infestation by *Diatraea saccharalis*, F. [*cf.* **24** 380]. The Pyralid, *Diaphania* (*Margaronia*) *hyalinata*, L., was effectively controlled on cucurbits by spraying regularly with synthetic cryolite in fish-oil soap solution. Other pests included *Empoasca fabalis*, DeLong, and *Frankliniella insularis*, Frankl., on beans, and the Coreids, *Zicca taeniola*, Dall., on tomatos, and *Anasa scorbutica*, F., which caused serious damage to a plantation of squash.

ROBÁ (R. P.). **La escama verde del cafeto : *Coccus viridis* Green.** [The Green Scale of Coffee.]—*Rev. cafet. Colombia* **6** no. 88–92 pp. 2087–2091, 3 figs., 8 refs. Bogotá, December 1936.

Data on the distribution, bionomics and control of *Coccus viridis*, Green, are briefly reviewed from the literature. It is occasionally injurious to coffee in Colombia, but never becomes a serious pest there, probably owing to the moist climate, the cultivation of coffee under shade, and natural enemies, which include a Coccinellid, *Azya* sp., Syrphid larvae, and a fungus believed to be *Cephalosporium lecanii*.

ROBÁ (R. P.). **El estado sanitario de los cafetales del Norte de Santander desde el punto de vista entomológico.** [The Condition of the Coffee Plantations of Norte de Santander from the entomological Point of View.]—*Rev. cafet. Colombia* **6** no. 88–92 pp. 2091–2095. Bogotá, December 1936.

No important insect pests were found during an inspection of coffee plantations in Norte de Santander, Colombia. Those observed included Limacodid larvae, 60 per cent. of which were parasitised by Tachinids, *Leucoptera coffeella*, Guér. [*cf. R.A.E.*, A **24** 390], *Coccus viridis*, Green, and *Pseudococcus* sp. The two Coccids were fostered by ants of the genus *Crematogaster*. The species of *Pseudococcus* was once found in symbiosis with a fungus on the roots ; it also occurred on the stalks of the berries, on which it was parasitised by Chalcidoids.

WILLE (J.). **Constatación de un nuevo insecto de la caña en la hacienda Infantas.** [Record of a new Pest of Sugar-cane on the Infantas Farm.]—*Mem. Estac. exp. agríc. La Molina* no. 6 (1933) pp. 272–273. Lima [? 1937].

The larvae of a Noctuid, probably of the genus *Trachea* (*Hadena*), are recorded as having injured the leaves of sugar-cane near La Molina, Peru, in 1933.

RONNA (A.). **Piolho ou pulga da abelha (*Braula coeca* Nitzsch).** [The Bee Louse, *B. coeca*.]—*Rev. Dep. nac. Prod. anim.* **3** no. 1–6 pp. 143–148, 3 figs., 16 refs. Rio de Janeiro, 1936.

A brief account is given of the bionomics of *Braula coeca*, Nitz. [*cf. R.A.E.*, A **20** 121, etc.], which has been known in Brazil since 1902 and is troublesome in bee-hives owing to the damage caused to the cells by the larvae. It is suggested that naphthalene placed in the corners of the hive would prevent infestation by acting as a repellent.

Krug (H. P.) & Mendes (L. O. T.). **Sobre a incidencia de** *Platyedra gossypiella* **Saund. e** *Dysdercus* **spp. e varias molestias cryptogamicas em capulhos de algodoeiro, durante o mez de Junho, 1936.** [The Incidence of *P. gossypiella* and *Dysdercus* spp. and various cryptogamic Diseases in Cotton Bolls during June 1936.]—*Bol. techn. Inst. agron. Campinas* no. 25, 10 pp., 2 refs. From *Rev. Agric.* **11** no. 11–12, 1936. Piracicaba, 1936. (With a Summary in English.)

The results are given of a detailed examination of 349 cotton bolls in Campinas, Brazil, made in June 1936 to ascertain the damage caused by insects, fungi and bacteria. It was found that practically all the bolls were damaged, either by *Platyedra gossypiella*, Saund., or by internal boll disease introduced by *Dysdercus*. It is therefore considered uneconomic to grow cotton after this month, and a close season from July to September, inclusive, is advocated.

da Costa Lima (A.). **Insetos do Brasil.** [Insects of Brazil.]—*Campo* **6** nos. 11–12 pp. 31–35, 11–19; **7** no. 73 pp. 14–18; nos. 75–79 pp. 17–23, 12–16, 17–21, 18–24, 33–41; nos. 81–84 pp. 15–25, 11–14, 8–17, 10–17; **8** nos. 85–86 pp. 38–41 & 75, 11–16; 151 figs., many refs. Rio de Janeiro, November–December 1935; January, March–July, September–December 1936; January–February 1937.

The first two parts of this paper have already been noticed [*R.A.E.*, A **24** 35]. These further parts deal in a similar manner with the Orthoptera, Dermaptera, Isoptera and Psocoptera, and the Neuropteroid Orders. The work is to be continued.

Gonçalves (C. R.). **Mais um percevejo sugador de laranjas.** [Another Bug sucking Oranges.]—*Campo* **8** no. 85 p. 52, 1 fig., 4 refs. Rio de Janeiro, January 1937.

The adults and nymphs of the Coreid, *Leptoglossus gonagra*, F., have been observed on orange trees near Rio de Janeiro, feeding on the fruit and causing it to rot. Similar injury to oranges in the same area has previously been caused by *L. stigma*, Hbst., and *Dysdercus longirostris*, Stål.

Blanchard (E. E.). **Microgastrinos argentinos, nuevos y poco conocidos. Segunda parte.** [New or little known Argentine Microgasterinae. Part II.]—*Physis* **12** no. 43 pp. 137–152, 7 figs. Buenos Aires, December 1936.

Seven species of *Apanteles* are described in this part [*cf. R.A.E.*, A **23** 361], including *A. bourquini*, sp. n., reared from *Porosagrotis gypaetina*, Gn., on wheat; *A. galleriae*, Wlkn., from *Galleria mellonella*, L., in bee-hives [**25** 166]; and *A. militaris*, Walsh, from *Cirphis unipuncta*, Haw.

Wright (J. A.). **Fruit Flies. Some common Species in New South Wales.**—*Agric. Gaz. N.S.W.* **48** pt. 1 pp. 26–28, 30, 1 ref., 6 figs. Sydney, 1st January 1937.

Notes and illustrations are given to distinguish six species of Trypetids that are common in New South Wales, *viz.*, *Dacus* (*Chaetodacus*) *gurneyi*, Perkins, *D.* (*C.*) *dorsalis*, Hendel, and *D.* (*C.*) *strigatus*,

Perkins, which have not been recorded from cultivated fruits, *D.* (*C.*) *ferrugineus* var. *tryoni*, Frogg., and *Ceratitis capitata*, Wied., which attack summer fruits and *Citrus*, and *Rioxa pornia*, Wlk., which has been bred from a number of wild and cultivated fruits, but only from those that have been previously damaged. The host-fruits of *D. gurneyi* and *D. dorsalis* (which is confined to *Solanum* in New South Wales) are listed ; those of *D. strigatus* are unknown.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **48** pt. 1 pp. 41–44, 52, 6 figs. Sydney, 1st January 1937.

In this part of a series on pests in New South Wales [*cf. R.A.E.*, A **25** 223], brief recommendations are given for the control of Coccids and mites infesting *Citrus* and of *Phyllocoptes lycopersici*, Tryon, on tomatos [**24** 211]. *Eriophyes tristriatus*, Nal., infesting walnut leaves, has recently been recorded from New South Wales for the first time, but is considered to be of little economic importance. The indigenous Lygaeid, *Oxycarenus luctuosus*, Montr., was unusually abundant in the summer of 1936–37 and was found feeding on figs, cherries, nectarines, raspberries and other fruits. It usually infests weeds, but was probably driven to attack cultivated plants owing to dry weather and consequent lack of herbage. Infested plants should be dusted with a mixture, prepared just before use, of equal parts of pyrethrum powder and 2½ per cent. nicotine dust.

Mani (M. S.). **A new Encyrtid Parasite (Chalcidoidea : Hymenoptera) of a Cockroach from India.**—*Rec. Indian Mus.* **38** pt. 2 pp. 131–132, 1 fig., 5 refs. Calcutta, June 1936. [Recd. March 1937.]

Both sexes are described of an Encyrtid, *Solindenia blattiphagus*, sp. n., bred from the oothecae of an unidentified cockroach found in a stored tamarind in Calcutta ; and the description of the genus *Solindenia*, Cameron, originally based on a female only, is amended to include the male.

Illustrations of injurious Forest Insects and Fungi. Insects No. 1. [*In Japanese.*]—10 pp., 5 col. pls. Tokyo, For. Exp. Sta., Imp. Household Bur. For., December 1936.

This paper deals with five insects that are injurious in forests in Japan, and includes descriptions of all stages of them. The over-wintered adults of the weevil, *Sipalus hypocrita*, Boh., appear in April and feed on the juices that exude from elm, oak and other trees. They lay their eggs in the bark of weakened or felled conifers, including *Chamaecyparis obtusa*, *Cryptomeria japonica* and pines. The larvae bore into the timber and pupate in June of the following year. Infestation may be prevented by removing the bark of the logs, or storing them in sunny places, as the beetles prefer to oviposit in the shade. If the wood is already infested, the insects in it can be destroyed by keeping it under water for 3 weeks or more. The Cerambycid, *Semanotus japonicus*, Lacord., which infests *Cryptomeria japonica* etc., attacks and sometimes kills healthy trees. The larvae pupate in September, and the adults emerge in late October, but remain in the timber until the following spring. They oviposit in the bark.

The adults of a Cecidomyiid of the genus *Contarinia* emerge in autumn and oviposit in the buds of pines. The larvae form galls, which contain up to 30 each, and mature in August or September, entering the soil for pupation on rainy days. The pupal stage lasts about 25 days. The same species apparently occurs in Korea. *Diprion* (*Neodiprion*) *sertifer*, Geoffr., which has one generation a year, causes serious injury to *Pinus densiflora*, but is rarely found on *P. thunbergi*. The larvae hatch from the overwintered eggs in April and are full-fed in about a month. Pupation occurs in September and early October, and the adults emerge later in the same months and oviposit in the needles. *Lymantria fumida*, Btlr., which attacks *Abies firma*, has one generation a year, overwintering in the egg stage. The larvae hatch in April or early May and pupate in late June and early July. The moths emerge a fortnight later.

Mori (N.). **Ecological Observation of** *Pyrrhalta annulicornis* **Baly.** [*In Japanese.*]—*Bot. & Zool.* **5** no. 3 pp. 610–614. Tokyo, March 1937.

Galerucella (*Pyrrhalta*) *annulicornis*, Baly, which feeds on *Viburnum*, has one generation a year in Japan, passing the winter in the egg stage. The adults occur from early June to late November, but are more or less inactive during the heat of the summer. Oviposition begins in mid-October, and the eggs hatch in the following April. The larvae feed on the young leaves and pupate in the soil in May. The pupal stage lasts about 12 days.

Esaki (T.), Hashimoto (S.) & Sameshima (T.). **Report on the Leaf-hoppers injurious to the Rice Plant and their natural Enemies, No. 8 (for the Year 1936).** [*In Japanese.*]—43 pp., 3 pls. Fukuoka, Ent. Lab., Dep. Agric., Kyushu Imp. Univ. April 1937.

Records, based on catches in a light-trap, are given of seasonal fluctuations in the numbers of the Jassids and Delphacids that attack rice in Oita, Kyushu ; in general, they were a little more abundant than in 1935 [*cf. R.A.E.*, A **24** 465].

A Trichogrammatid, the adult of which is described, was found parasitising the eggs of *Nephotettix bipunctatus cincticeps*, Uhler, and *Nilaparvata oryzae*, Mats. ; and the Sphegid, *Mimesa sameshimai*, Yasumatsu, sp. n., which is described in English, was predacious on *Sogata furcifera*, Horv. Males of *Nephotettix* that showed female colouration and were parasitised by a Pipunculid were first observed in late July and were numerous in August. A suspension of the fungus, *Entomophthora delphacis* [*cf. loc. cit.*], was sprayed on *Nephotettix* and *Nilaparvata* in captivity, and 63·6–100 per cent. of them became infected. Experiments on the transmission by *Nephotettix* of the virus (dwarf) disease of rice gave positive results in a high percentage of cases.

Miwa (Y.). **Insect Pests of Coffee and Coffee-trees. I.** [*In Japanese.*] —*Bull. Govt Res. Inst. Formosa* no. 126, 33 pp. Taihoku, Formosa, December 1936.

A list is given of nearly 150 insects known to attack coffee in various parts of the world, and notes, chiefly from the literature, on 29 that occur in Formosa. The latter include the Cossid, *Zeuzera coffeae*,

Nietn., the Cerambycid, *Xylotrechus grayi*, White, the adults of which emerge in May and July and oviposit underneath the bark, and *Coccus viridis*, Green, and other common scale insects. The Anthribid, *Araecerus* (*Araeocerus*) *fasciculatus*, DeG., is found only in the southern part of the Island. Its larvae attack the seeds, and the adults emerge from July to November.

Nishimura (K.). **Present Status of the Breeding of** *Saturnia pyretorum* **West., a wild Silkworm, in Taichu Prefecture, Formosa.** [*In Japanese.*]—*Taiwan no Sanrin* no. 131 pp. 29–33. Taihoku, Formosa, March 1937.

Eggs of *Saturnia pyretorum*, Westw., were imported into Formosa from Hainan (China) in 1908, but attempts to rear it on a large scale during the next two years were unsuccessful. The silk obtained from the larvae is of value for fishing lines, etc. In 1922, however, the work was renewed and, as a result, the moth has been established in central Formosa. It breeds on *Liquidambar formosana* (one tree supporting about 300 larvae) and has one generation a year. The moths emerge from mid-December to the end of January, and a female lays about 350 eggs. The larvae hatch in 3 or 4 weeks, and pupate in late April or early May.

Hoffmann (W. E.). **Life History Notes on a Species of** *Lawana* **(Homoptera, Flatidae).**—*Lingnan Sci. J.* **14** no. 3 pp. 521–524, 3 pls., 4 refs. Canton, 1st July 1935. *Lawana* **increasing in Importance as a noxious Insect (Homoptera, Flatidae).**—*Op. cit.* **16** no. 1 pp. 119–120. Canton, 13th January 1937.

In the first paper, a species of *Lawana*, tentatively identified by W. E. China as *L. imitata*, Mel., is recorded as infesting 10 plants in 9 different Orders, including *Citrus* and peach, in Kwangtung and Fukien. The nymph and adult are briefly described. In the second paper, 5 additional food-plants are given from 4 more Orders.

Chen (Fong-ge). **Notes on the Biology and Control of** *Clitea metallica* **Chen (Col. Chrysomelidae).** [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 27 pp. 530-538. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 129. Canton, 13th January 1937.)

Notes are given on the bionomics and control of the Halticid, *Clitea metallica*, Chen, which is a serious pest of *Citrus* in China. The larvae attack the buds, young leaves, flowers and fruit. Lead arsenate and Bordeaux mixture are recommended against the adults, and "tu yu t'eng" [probably derris, according to a paper already noticed (*R.A.E.*, A **23** 117)] against the larvae.

Wong (Chi-yu) & Chin (Meng-hsiao). **Notes on the Hibernation and Aestivation of** *Colaphellus bowringi* **Baly (Col. Chrysomelidae).** [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 29 pp. 574–577, 2 graphs. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 131. Canton, 13th January 1937.)

Colaphellus bowringi, Baly, a serious pest of crucifers in China [*R.A.E.*, A **23** 440; **24** 479], has two generations a year. Hibernation and

aestivation were both found to occur in the adult stage at a depth of about 6 ins. in the soil, and lasted from October to April and from May to September, respectively. The death rate was 16–48 per cent. during hibernation and considerably higher during aestivation.

Chu (Joo-tso). **Distribution and Prevalence of Mulberry Insects of Chekiang Province.** [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 28 pp. 550–559. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 132. Canton, 13th January 1937.)

A list is given of 126 insect pests of mulberry that occur in Chekiang, showing their scientific and popular names, their distribution, the part of the plant they attack, and the degree of injury they cause.

Hsu (Ching-chao). **The Influence on the Control of *Pectinophora gossypiella* Saund. of destroying the infested Flowers.** [*In Chinese.*] —*Ent. & Phytopath.* **4** no. 32 pp. 641–642. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 137. Canton, 13th January 1937.)

The author considers that the destruction of cotton flowers infested by *Platyedra* (*Pectinophora*) *gossypiella*, Saund., is of value in its control, and briefly discusses the way in which the work should be carried out.

Ku (Kuang). **The Cultivation of " Yu T'eng."** [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 27 pp. 538–541. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 138. Canton, 13th January 1937.)

An account is given of the best method of cultivation in China of " yu t'eng " [*Millettia pachycarpa*], from which an insecticide can be prepared.

Kuo (Li-sien). **Boric Acid, a new Insecticide for Granary Pests.** [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 30 pp. 600–604. Hangchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 139. Canton, 13th January 1937.)

An account is given of experiments showing that boracic acid is effective in the control of pests of stored cereals, such as *Calandra oryzae*, L., in rice [*cf. R.A.E.*, A **24** 630]. It should be mixed with the grain at the rate of 1 : 750 by weight in a tightly closed container or up to 1 : 500 under less airtight conditions.

Loureiro Ferreira (M. J.). **Notas de patologia vegetal e entomologia agricola.**—*Rev. agron.* **24** no. 2 repr. 3 pp. Lisbon, 1936.

Ceroplastes sinensis, Del G., on pomegranate, and a Coccid thought to be *Lecanium* (*Eulecanium*) *corylí*, L., on plum and pear are recorded from Portugal, both apparently for the first time.

Köck (G.), Löschnig (J.) & Miestinger (K.). **Krankheiten und Schädlinge im Obstbau und ihre Bekämpfung.** [Diseases and Pests in Fruit Growing and their Control.]—4te Aufl., 164 pp., 74 figs. Vienna, Scholle-Verlag, 1936.

The largest section (pp. 48–126) of this book comprises an account of the bionomics of 92 pests or groups of pests, chiefly insects, of

orchards and small fruits in Austria, together with brief notes on the measures for the control of each. Another section deals with the methods and technique of the control of these pests and of diseases. An index to subjects, including the popular names of the insects, is appended.

Vinas (J.). **La protection des cultures par traitement à sec. Les poudres insecticides et anticryptogamiques. Leurs propriétés et leur préparation.**—*Rev. Vitic.* **84** nos. 2 187–2 190 pp. 349–357, 365–370, 387–390, 397–406, 5 figs. Paris, 1936.

This paper on the use of dust insecticides and fungicides, which is compiled from the literature, includes a survey of the advantages of dusting over spraying against *Leptinotarsa decemlineata*, Say, on potato [*cf. R.A.E.*, A **24** 308; **22** 558], and against vine-moths [*cf.* **23** 289], together with notes on the physical properties of dusts [*cf.* **23** 523, etc.], the technique of their application, and various types of dusting equipment.

Papers noticed by Title only.

[Korotkikh (G.) & Rafes (P.).] **Коротких (Г.) и Рафес (П.). A Guide to the Literature that has appeared during the Years 1920–1935 in Russian and other Languages of the USSR on the Use of Aeroplanes in National Economy (chiefly Agriculture and Forestry).** [A bibliography including numerous papers on the use of aeroplanes for applying insecticides.] [*In Russian.*]—La. Cr. 8vo, 83 pp. Moscow, Trud. econ. Sekt. Komit. Econ. i Prava vozd. Flota Osoaviakhima, 1937. Price 1 *rub.* 50 *kop.*

[Yatzenko (I. P.).] **Яценко (И. П.)** Ed. **Investigations on the Machinery for Plant Protection.** [Including descriptions and tests in 1932–35 of apparatus designed in Russia and elsewhere for applying sprays, dusts and poisoned baits, treating nursery stock with hot water, and fumigating.] [*In Russian.*]—*Bull. Plant Prot.* (3 Contr. Meas. Impl.) no. 8, 183 pp., illus. Leningrad, 1936. Price 5 *rub.* 25 *kop.*

Goodhue (L. D.) & Smith (C. M.). **The Particle Size of Insecticidal Dusts. A new Differential Manometer-type Sedimentation Apparatus.**—*Industr. Engng Chem.* Anal. Edn **8** pp. 469–472, 2 figs., 9 refs. Easton, Pa, November 1936.

Spies (J. R.). **Determination of Small Quantities of Nicotine by a Silicotungstic Acid Micromethod.**—*Industr. Engng Chem.* Anal. Edn **9** pp. 46–47, 1 fig., 7 refs. Easton, Pa, January 1937.

Smith (L. E.). **The Use of Phenothiazine** [Thiodiphenylamine] **as an Insecticide.** [A review of the literature.]—*E. 399* 11 pp., multigraph, 19 refs. [Washington, D.C.] U.S. Dep. Agric., Bur. Ent., January 1937.

ROARK (R. C.). **Review of United States Patents relating to Pest Control** [July–December 1936].—**9** nos. 7–12 ; 10, 8, 9, 11, 9, 8 pp. multigraph. [Washington, D.C.] U.S. Dep. Agric., Bur. Ent., 1936.

SNYDER (T. E.). **Preventing Damage by** *Lyctus* **Powder-post Beetles.**—*Fmrs' Bull. U.S. Dep. Agric.* no. 1477, 13 pp., 10 figs., 1 ref. Washington, D.C., September 1936. [Recd. March 1937 : revision, *cf. R.A.E.*, A **14** 293.]

GOBEIL (A. R.). **Population Study of** *Ips perturbatus* **Eichh.** [on a spruce tree (*Picea glauca*) in the Gaspé Peninsula].—*Rep. ent. Soc. Ont.* **66** (1935) pp. 11–14, 1 fig., 1 ref. Toronto, 1936. [*Cf. R.A.E.*, A **25** 285.]

PALM (C. E.). **The present Status of the Alfalfa Snout Beetle** (*Brachyrhinus* [*Otiorrhynchus*] *ligustici* **L.**) **in New York State.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 48–54 1 ref. Toronto, 1936. [*Cf. R.A.E.*, A **25** 179.]

SHEPPARD (R. W.). **Insect Collections from Niagara's colored Searchlights.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 69–75. Toronto, 1936.

TWINN (C. R.). **A Summary of Insect Conditions in Canada in 1935.**—*Rep. ent. Soc. Ont.* **66** (1935) pp. 80–95. Toronto, 1936.

DA COSTA LIMA (A.). **Um novo microhimenoptero parasito de ovos de pentatomideo (Proctotrypoidea : Scelionidae).** [*Microphanurus scuticarinatus*, sp. n., parasitising Eggs of *Piezodorus guildinii*, Westw., in Brazil.]—*Campo* **8** no. 85 p. 49, 3 figs. Rio de Janeiro, January 1937.

SCHOUTEDEN (H.). **Un capside parasite du ricin** [*Eurystylus kivuensis*, sp. n., on *Ricinus communis* in the Belgian Congo].—*Rev. Zool Bot. afr.* **29** no. 2 pp. 216–217. Brussels, February 1937.

TAKAHASHI (R.). **Three new Species of** *Dialeurodes* **from China (Homoptera : Aleyrodidae)** [including *D. chitinosa* and *D. cinnamomicola* on *Cinnamomum* sp.].—*Lingnan Sci. J.* **16** no. 1 pp. 21–25, 3 figs. Canton, January 1937.

TAKAHASHI (R.). **Aphids from Kikungshan, Honan, China, including two new Species (Homoptera).**—*Lingnan Sci. J.* **16** no. 1 pp. 53–60, 2 figs. Canton, January 1937.

HSU (Ching-chao). **The Characters distinguishing the Damage caused to Cotton in China by** *Pectinophora* [*Platyedra*] *gossypiella* **Saund.,** *Earias chromataria* **Walker, and** *Heliothis obsoleta*, **Fab.** [*armigera*, Hb.]. [*In Chinese.*]—*Ent. & Phytopath.* **4** no. 29 pp. 580–582. Hanchow, 1936. (Abstr. in *Lingnan Sci. J.* **16** no. 1 p. 137. Canton, January 1937.)

ROONWAL (M. L.). **Studies on the Embryology of the African Migratory Locust** *Locusta migratoria migratorioides* **Reiche and Frm. (Orthoptera, Acrididae). II. Organogeny.**—*Philos. Trans.* (B) **227** no. 543 pp. 175–244, 7 pls., 15 figs., 4 pp. refs. London, 9th April 1937. [*Cf. R.A.E.*, A **25** 56.]

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COMPTES RENDUS DES SÉANCES DE L'ACADÉMIE D'AGRICULTURE DE FRANCE (PARIS): Tome VIII (1922) No. 5.

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GRASSI (B.) et al. Contributo alla conoscenza delle Filloserine ed in particolare della Fillossera della Vite (Rome, 1912).

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PORTO RICO DEPARTMENT OF AGRICULTURE, &C. (SAN JUAN): Journal, Vol. I (1917). No. 3.

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